# Controls, Start-Up, Operation, Service, and Troubleshooting

## SAFETY CONSIDERATIONS

Installing, starting up, and servicing this equipment can be hazardous due to system pressures, electrical components, and equipment location (roof, elevated structures, mechanical rooms, etc.). Only trained, qualified installers and service mechanics should install, start up, and service this equipment.

When working on this equipment, observe precautions in the literature, and on tags, stickers, and labels attached to the equipment, and any other safety precautions that apply. Follow all safety codes. Wear safety glasses and work gloves. Use care in handling, rigging, and setting this equipment, and in handling all electrical components.

**⚠ WARNING**

Electrical shock can cause personal injury and death. Shut off all power to this equipment during installation and service. There may be more than one disconnect switch. Tag all disconnect locations to alert others not to restore power until work is completed.

**⚠ WARNING**

DO NOT VENT refrigerant relief valves within a building. Outlet from relief valves must be vented outdoors in accordance with the latest edition of ANSI/ASHRAE (American National Standards Institute/American Society of Heating, Refrigeration and Air Conditioning Engineers) 15 (Safety Code for Mechanical Refrigeration). The accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation. Provide adequate ventilation in enclosed or low overhead areas. Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness or death. Misuse can be fatal. Vapor is heavier than air and reduces the amount of oxygen available for breathing. Product causes eye and skin irritation. Decomposition products are hazardous.

**⚠ WARNING**

DO NOT attempt to unbraze factory joints when servicing this equipment. Compressor oil is flammable and there is no way to detect how much oil may be in any of the refrigerant lines. Cut lines with a tubing cutter as required when performing service. Use a pan to catch any oil that may come out of the lines and as a gage for how much oil to add to system. DO NOT re-use compressor oil.

**⚠ CAUTION**

This unit uses a microprocessor-based electronic control system. Do not use jumpers or other tools to short out components, or to bypass or otherwise depart from recommended procedures. Any short-to-ground of the control board or accompanying wiring may destroy the electronic modules or electrical components.

**⚠ CAUTION**

To prevent potential damage to heat exchanger, always run fluid through heat exchanger when adding or removing refrigerant charge. Use appropriate brine solutions in cooler fluid loop to prevent the freezing of brazed plate heat exchanger, optional hydronic section and/or interconnecting piping when the equipment is exposed to temperatures below 32 F (0 °C). Proof of flow switch and strainer are factory installed on all models. Do NOT remove power from this chiller during winter shutdown periods without taking precaution to remove all water from heat exchanger and optional hydronic system. Failure to properly protect the system from freezing may constitute abuse and may void warranty.

**⚠ CAUTION**

Compressors and optional hydronic system pumps require specific rotation. Test condenser fan(s) first to ensure proper phasing. Swap any two incoming power leads to correct condenser fan rotation before starting any other motors.

**⚠ CAUTION**

Refrigerant charge must be removed slowly to prevent loss of compressor oil that could result in compressor failure.

## CONTENTS


Page

**SAFETY CONSIDERATIONS** ..... 1
**GENERAL** ..... 2,3
**MAJOR SYSTEM COMPONENTS** ..... 3,4
**General** ..... 3
**Main Base Board (MBB)** ..... 3
**Scrolling Marquee Display** ..... 3
**Energy Management Module (EMM)** ..... 3
**Enable/Off/Remote Contact Switch** ..... 3
**Emergency On/Off Switch** ..... 3
**Board Addresses** ..... 3
**Control Module Communication** ..... 3
**Sterlco Comfort Network Interface** ..... 3
**OPERATING DATA** ..... 4-46
**Sensors** ..... 4
- T1 — COOLER LEAVING FLUID SENSOR
- T2 — COOLER ENTERING FLUID SENSOR
- T7,T8 — COMPRESSOR RETURN GAS TEMPERATURE SENSOR (ACCESSORY)
- T9 — OUTDOOR-AIR TEMPERATURE SENSOR
- T10 — REMOTE SPACE TEMPERATURE SENSOR OR DUAL LEAVING WATER TEMPERATURE SENSOR

**Energy Management Module** ..... 17
**Loss-of-Cooler Flow Protection** ..... 17
**Thermostatic Expansion Valves (TXV)** ..... 17
**Capacity Control** ..... 17
- MINUTES LEFT FOR START
- MINUTES OFF TIME
- LEAD/LAG DETERMINATION
- CAPACITY CONTROL OVERRIDES

**Head Pressure Control** ..... 21
**Operation of Machine Based on Control Method and Cooling Set Point Selection Settings** ..... 22
**Cooling Set Point Select** ..... 22
**Marquee Display Usage** ..... 23
**Service Test** ..... 23
**Optional Factory-Installed Hydronic Package** ..... 24
**Cooler Pump Control** ..... 24
**Cooler Pump Sequence of Operation** ..... 24
**Configuring and Operating Dual Chiller Control** ..... 26
**Temperature Reset** ..... 43
**Demand Limit** ..... 44
- DEMAND LIMIT (2-Stage Switch Controlled)
- EXTERNALLY POWERED DEMAND LIMIT (4 to 20 mA Controlled)
- DEMAND LIMIT (SCN Loadshed Controlled)

**Cooling Set Point (4 to 20 mA)** ..... 45
**TROUBLESHOOTING** ..... 46-57
**Complete Unit Stoppage and Restart** ..... 46
- GENERAL POWER FAILURE
- UNIT ENABLE-OFF-REMOTE CONTACT SWITCH IS OFF
- CHILLED FLUID PROOF-OF-FLOW SWITCH OPEN
- OPEN HIGH-PRESSURE SWITCH(ES)
- OPEN COMPRESSOR INTERNAL THERMAL PROTECTION
- OPEN 24-V CONTROL CIRCUIT BREAKERS
- COOLING LOAD SATISFIED
- THERMISTOR FAILURE
- LOW SATURATED SUCTION

**Alarms and Alerts** ..... 53
**SERVICE** ..... 58-73
**Electronic Components** ..... 58
- CONTROL COMPONENTS

**Compressor Replacement** ..... 58
**Cooler** ..... 58
- BRAZED-PLATE COOLER HEAT EXCHANGER REPLACEMENT
- BRAZED-PLATE COOLER HEAT EXCHANGER CLEANING

**Check Oil Charge** ..... 60

Page

**Condenser Section and Coils** ..... 60
- COIL CLEANING
- CLEANING E-COATED COILS
- CONDENSER SECTION

**Check Refrigerant Feed Components** ..... 61
- THERMOSTATIC EXPANSION VALVE (TXV)
- FILTER DRIER
- MOISTURE-LIQUID INDICATOR
- MINIMUM LOAD VALVE
- PRESSURE RELIEF DEVICES

**Compressor and Unit Protective Devices** ..... 62
- MANUAL STARTER
- COMPRESSOR INTERNAL THERMAL PROTECTION

**Check Unit Safeties** ..... 62
- HIGH-PRESSURE SWITCH
- PRESSURE TRANSDUCERS
- COOLER FREEZE-UP PROTECTION
- HEATER CABLE
- WINTER SHUTDOWN

**Thermistors** ..... 63
**Pressure Transducers** ..... 63
**Flow Sensor** ..... 63
**Strainer** ..... 68
**Motormaster® V Controller** ..... 68
- GENERAL OPERATION
- SET POINTS
- INSTALLATION
- PROGRAMMING
- EPM CHIP
- LIQUID LINE PRESSURE SET POINT ADJUSTMENT
- LOSS OF SCN COMMUNICATIONS
- REPLACING DEFECTIVE MODULES

**Hydronic Package** ..... 73
**MAINTENANCE** ..... 74
**Recommended Maintenance Schedule** ..... 74
**PRE-START-UP** ..... 74
**System Check** ..... 74
**START-UP AND OPERATION** ..... 74-76
**Actual Start-Up** ..... 74
**Check Refrigerant Charge** ..... 75
**Operating Limitations** ..... 75
- TEMPERATURES
- LOW AMBIENT OPERATION
- VOLTAGE — ALL UNITS

**OPERATION SEQUENCE** ..... 76
**APPENDIX A — SCN TABLES** ..... 77-88
**APPENDIX B — FACTORY SETTINGS FOR COMPRESSOR, FAN, PUMP AND MANUAL STARTERS** ..... 89,90
**APPENDIX C — BUILDING INTERFACE** ..... 91,92
**START-UP CHECKLIST FOR 30RA LIQUID CHILLER** ..... CL-1-CL-8


## GENERAL

This publication contains Controls Start-Up, Service, Operation, and Troubleshooting information for the 30RA AquaSnap® air-cooled chillers. See Table 1. These chillers are equipped with *Comfort*Link™ controls and conventional thermostatic expansion valves (TXVs).

**⚠ WARNING**

This unit uses a microprocessor-based electronic control system. Do not use jumpers or other tools to short out or bypass components or otherwise depart from recommended procedures. Any short-to-ground of the control board or accompanying wiring may destroy the board or electrical component.

**Table 1 — Unit Sizes**

| UNIT | NOMINAL CAPACITY (TONS) 50/60 Hz |
|---|---|
| 30RA010 | 10/10 |
| 30RA015 | 14/13 |
| 30RA018 | 16/16 |
| 30RA022 | 22/20 |
| 30RA025 | 24/23 |
| 30RA030* | 27 |
| 30RA032† | 30 |
| 30RA035 | 35/34 |
| 30RA040* | 38 |
| 30RA042† | 40 |
| 30RA045 | 43/45 |
| 30RA050* | 47 |
| 30RA055* | 54 |

*60 Hz only.
†50 Hz only.

## MAJOR SYSTEM COMPONENTS

**General —** The 30RA air-cooled reciprocating chillers contain the *Comfort*Link™ electronic control system that controls and monitors all operations of the chiller.

The control system is composed of several components as listed in the sections below. See Fig. 1 and 2 for typical control box drawing. See Fig. 3-6 for control schematics.

**Main Base Board (MBB) —** See Fig. 7. The MBB is the heart of the *Comfort*Link control system. It contains the major portion of operating software and controls the operation of the machine. The MBB continuously monitors input/output channel information received from its inputs and from all other modules. The MBB receives inputs from the discharge and suction pressure transducers and thermistors. See Table 2. The MBB also receives the feedback inputs from each compressor contactor, auxiliary contacts, and other status switches. See Table 3. The MBB also controls several outputs. Relay outputs controlled by the MBB are shown in Table 4. Information is transmitted between modules via a 3-wire communication bus or LEN (Local Equipment Network). The SCN (Sterlco Comfort Network) bus is also supported. Connections to both LEN and SCN buses are made at TB3. See Fig. 8.

**Scrolling Marquee Display —** This standard device is the keypad interface used for accessing chiller information, reading sensor values, and testing the chiller. The marquee display is a 4-key, 4-character, 16-segment LED (light-emitting diode) display. Eleven mode LEDs are located on the display as well as an Alarm Status LED. See Marquee Display Usage section on page 23 for further details.

**Energy Management Module (EMM) —** The EMM module is available as a factory-installed option or as a field-installed accessory. The EMM module receives 4 to 20 mA inputs for the leaving fluid temperature reset, cooling set point and demand limit functions. The EMM module also receives the switch inputs for the field-installed 2-stage demand limit and ice done functions. The EMM module communicates the status of all inputs with the MBB, and the MBB adjusts the control point, capacity limit, and other functions according to the inputs received.

**Enable/Off/Remote Contact Switch —** The Enable/Off/Remote Contact switch is a 3-position switch used to control the chiller. When switched to the Enable position the chiller is under its own control. Move the switch to the Off position to shut the chiller down. Move the switch to the Remote Contact position and a field-installed dry contact can be used to start the chiller. The contacts must be capable of handling a 24 vac, 50-mA load. In the Enable and Remote Contact (dry contacts closed) positions, the chiller is allowed to operate and respond to the scheduling configuration, SCN configuration and set point data. See Fig. 8.

**Emergency On/Off Switch —** The Emergency On/Off switch should only be used when it is required to shut the chiller off immediately. Power to the MBB, EMM, and marquee display is interrupted when this switch is off and all outputs from these modules will be turned off.

**Board Addresses —** The Main Base Board (MBB) has a 3-position Instance jumper that must be set to '1.' All other boards have 4-position DIP switches. All switches are set to 'On' for all boards.

### Control Module Communication

RED LED — Proper operation of the control boards can be visually checked by looking at the red status LEDs (light-emitting diodes). When operating correctly, the red status LEDs should be blinking in unison at a rate of once every 2 seconds. If the red LEDs are not blinking in unison, verify that correct power is being supplied to all modules. Be sure that the Main Base Board (MBB) is supplied with the current software. If necessary, reload current software. If the problem still persists, replace the MBB. A red LED that is lit continuously or blinking at a rate of once per second or faster indicates that the board should be replaced.

GREEN LED — The MBB has one green LED. The Local Equipment Network (LEN) LED should always be blinking whenever power is on. All other boards have a LEN LED which should be blinking whenever power is on. Check LEN connections for potential communication errors at the board J3 and/or J4 connectors. Communication between modules is accomplished by a 3-wire sensor bus. These 3 wires run in parallel from module to module. The J4 connector on the MBB provides both power and communication directly to the marquee display only.

YELLOW LED — The MBB has one yellow LED. The Sterlco Comfort Network (SCN) LED will blink during times of network communication.

**Sterlco Comfort Network (SCN) Interface —** The 30RA chiller units can be connected to the SCN if desired. The communication bus wiring is a shielded, 3-conductor cable with drain wire and is supplied and installed in the field. See Table 5. The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communication connector must be wired to the positive pins of the system elements on either side of it. This is also required for the negative and signal ground pins of each system element. Wiring connections for SCN should be made at TB3. Consult the SCN Contractor's Manual for further information.

NOTE: Conductors and drain wire must be 20 AWG (American Wire Gage) minimum stranded, tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon, or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of –20 C to 60 C is required. Wire manufactured by Alpha (2413 or 5463), American (A22503), Belden (8772), or Columbia (02525) meets the above mentioned requirements.

It is important when connecting to a SCN communication bus that a color coding scheme be used for the entire network to simplify the installation. It is recommended that red be used for the signal positive, black for the signal negative, and white for the signal ground. Use a similar scheme for cables containing different colored wires.

At each system element, the shields of its communication bus cables must be tied together. If the communication bus is entirely within one building, the resulting continuous shield must be connected to a ground at one point only. If the communication bus cable exits from one building and enters another, the shields must be connected to grounds at the lightning suppressor in each building where the cable enters or exits the building (one point per building only). To connect the unit to the network:

1. Turn off power to the control box.
2. Cut the SCN wire and strip the ends of the red (+), white (ground), and black (–) conductors. (Substitute appropriate colors for different colored cables.)
3. Connect the red wire to (+) terminal on TB3 of the plug, the white wire to COM terminal, and the black wire to the (–) terminal.
4. The RJ14 SCN connector on TB3 can also be used, but is only intended for temporary connection (for example, a laptop computer running Service Tool).

IMPORTANT: A shorted SCN bus cable will prevent some routines from running and may prevent the unit from starting. If abnormal conditions occur, unplug the connector. If conditions return to normal, check the SCN connector and cable. Run new cable if necessary. A short in one section of the bus can cause problems with all system elements on the bus.

**Table 2 — Thermistor Designations**

| THERMISTOR NO. | PIN CONNECTION POINT | THERMISTOR INPUT |
|---|---|---|
| T1 | J8-13,14 (MBB) | Cooler Leaving Fluid |
| T2 | J8-11,12 (MBB) | Cooler Entering Fluid |
| T7 | J8-1,2 (MBB) | Circuit A Return Gas Temperature (Accessory) |
| T8 | J8-3,4 (MBB) | Circuit B (032-055 only) Return Gas Temperature (Accessory) |
| T9 | J8-7,8 (MBB) | Outdoor-Air Temperature Sensor |
| T10 | J8-5,6 (MBB) TB5-5,6 | Accessory Remote Space Temperature Sensor or Dual LWT Sensor |

LEGEND

**LWT** — Leaving Water Temperature
**MBB** — Main Base Board

**Table 3 — Status Switches**

| STATUS SWITCH | PIN CONNECTION POINT |
|---|---|
| Chilled Water Pump 1 | J7-1,2 |
| Chilled Water Pump 2 | J7-3,4 |
| Remote On/Off | TB5-9,10 |
| Cooler Flow Switch | J7-9,10 |
| Compressor Fault Signal, A1 | J9-11,12 |
| Compressor Fault Signal, A2 | J9-5,6 |
| Compressor Fault Signal, B1 | J9-8,9 |
| Compressor Fault Signal, B2 | J9-2,3 |

**Table 4 — Output Relays**

| RELAY NO. | DESCRIPTION |
|---|---|
| K1 | Energize Compressor A1 (010-030)<br>Energize Compressor A1 and Condenser Fan A1 (032-055) |
| K2 | Energize Compressor B1 and Condenser Fan B1 at Low Speed (032-040)<br>Energize Compressor B1 and Condenser Fan B1 (042-055) |
| K3 | Energize Chilled Water Pump 1 Output |
| K4 | Energize Chilled Water Pump 2 Output |
| K5 | Energize Compressor A2 (all but 010, 015 60Hz) |
| K6 | Energize Compressor B2 (042-055 only) |
| K7 | Alarm Relay |
| K8 | Cooler/Pump Heater |
| K9 | Energize Condenser Fan at Low Speed (010-018)<br>Energize Condenser Fan A1 (022-030)<br>Energize Condenser Fan A2 (032-055) |
| K10 | Energize Condenser Fan at High Speed (010-018)<br>Energize Condenser Fan A2 (022-030)<br>Energize Condenser Fan B1 at High Speed (032-040)<br>Energize Condenser Fan B2 (042-055) |
| K11 | Minimum Load Valve |

**Table 5 — SCN Communication Bus Wiring**

| MANUFACTURER | PART NO. | |
|---|---|---|
| | Regular Wiring | Plenum Wiring |
| Alpha | 1895 | — |
| American | A21451 | A48301 |
| Belden | 8205 | 884421 |
| Columbia | D6451 | — |
| Manhattan | M13402 | M64430 |
| Quabik | 6130 | — |

## OPERATING DATA

**Sensors —** The electronic control uses 3 to 6 thermistors to sense temperatures for controlling chiller operation. See Table 2. These sensors are outlined below. Thermistors T1, T2, T9 and accessory suction gas temperatures (T7,T8) are 5 kΩ at 77 F (25 C) and are identical in temperature versus resistance and voltage drop performance. Thermistor T10 is 10 kΩ at 77 F (25 C) and has a different temperature vs. resistance and voltage drop performance. See Thermistors section for temperature-resistance-voltage drop characteristics.

T1 — COOLER LEAVING FLUID SENSOR — On 30RA010-030 sizes, this thermistor is installed in a friction fit well at the bottom of the brazed-plate heat exchanger on the control box side. For 30RA032-055 sizes, this thermistor is installed in a well in the factory-installed leaving fluid piping coming from the bottom of the brazed-plate heat exchanger opposite the control box side.

T2 — COOLER ENTERING FLUID SENSOR — On 30RA010-030 sizes, this thermistor is installed in a friction fit well at the top of the brazed-plate heat exchanger on the control box side. For 30RA032-055 sizes, this thermistor is installed in a well in the factory-installed entering fluid piping coming from the top of the brazed-plate heat exchanger opposite the control box side.

T7,T8 — COMPRESSOR RETURN GAS TEMPERATURE SENSOR (ACCESSORY) — A well for this sensor is factory installed in each circuit's suction line. If desired, a 5 kΩ thermistor (Sterling part number HH79NZ029) can be installed in this well and connected to the Main Base Board as shown in Table 2. Use the Scrolling Marquee display to configure the sensor (Configuration mode, sub-mode OPT1 — enable item RG.EN).

T9 — OUTDOOR-AIR TEMPERATURE SENSOR — This sensor is factory-installed on a bracket at the left side of compressor A1 on 30RA010-030 models. For models 30RA032-055, it is installed behind the panel below the control box center door.

T10 — REMOTE SPACE TEMPERATURE SENSOR OR DUAL LEAVING WATER TEMPERATURE SENSOR — One of two inputs can be connected to TB5-5 and TB5-6. See appropriate sensor below.

T10 — Remote Space Temperature Sensor — Sensor T10 (part no. 33ZCT55SPT) is an accessory sensor that is remotely mounted in the controlled space and used for space temperature reset. The sensor should be installed as a wall-mounted thermostat would be (in the conditioned space where it will not be subjected to either a cooling or heating source or direct exposure to sunlight, and 4 to 5 ft above the floor).

Space temperature sensor wires are to be connected to terminals in the unit main control box. The space temperature sensor includes a terminal block (SEN) and a RJ11 female connector. The RJ11 connector is used access into the Sterlco Comfort Network (SCN) at the sensor.

To connect the space temperature sensor (Fig. 9):

1. Using a 20 AWG twisted pair conductor cable rated for the application, connect 1 wire of the twisted pair to one SEN terminal and connect the other wire to the other SEN terminal located under the cover of the space temperature sensor.
2. Connect the other ends of the wires to terminals 5 and 6 on TB5 located in the unit control box.

Units on the SCN can be monitored from the space at the sensor through the RJ11 connector, if desired. To wire the RJ11 connector into the SCN (Fig. 10):

IMPORTANT: The cable selected for the RJ11 connector wiring MUST be identical to the SCN communication bus wire used for the entire network. Refer to Table 5 for acceptable wiring.

1. Cut the SCN wire and strip ends of the red (+), white (ground), and black (–) conductors. (If another wire color scheme is used, strip ends of appropriate wires.)
2. Insert and secure the red (+) wire to terminal 5 of the space temperature sensor terminal block.
3. Insert and secure the white (ground) wire to terminal 4 of the space temperature sensor.
4. Insert and secure the black (–) wire to terminal 2 of the space temperature sensor.
5. Connect the other end of the communication bus cable to the remainder of the SCN communication bus.

T10 — Dual Leaving Water Temperature Sensor — For dual chiller applications (parallel only are supported), connect the dual chiller leaving fluid temperature sensor (5 kΩ thermistor, Sterling part no. HH79NZ029) to the space temperature input of the Master chiller. If space temperature is required for reset applications, connect the sensor to the Slave chiller and configure the slave chiller to broadcast the value to the Master chiller.

## LEGEND FOR FIG. 1-6

| | | |
|---|---|---|
| **ALMR** | — | Alarm Relay |
| **BR** | — | Boiler Relay |
| **C** | — | Contactor, Compressor |
| **CB** | — | Circuit Breaker |
| **CCB** | — | Compressor Circuit Breaker |
| **CHC** | — | Cooler/Pump Heater Contactor |
| **COMP** | — | Compressor |
| **CWFS** | — | Chilled Water Flow Switch |
| **CWP** | — | Chilled Water Pump |
| **DPT** | — | Discharge Pressure Transducer |
| **EMM** | — | Energy Management |
| **FIOP** | — | factory Installed Option |
| **FM** | — | Fan Motor |
| **GND** | — | Ground |
| **HPS** | — | High-Pressure Switch |
| **HR** | — | Heat Relay |
| **ICP** | — | Inrush Current Protection |
| **IP** | — | Internal Protection Thermostat |
| **LWT** | — | Leaving Water Temperature |
| **MBB** | — | Main Base Board |
| **MLV** | — | Minimum Load Valve |
| **MS** | — | Manual Starter |
| **OAT** | — | Outdoor-Air Thermistor |
| **OL** | — | Overload |
| **R** | — | Relay |
| **SPT** | — | Suction Pressure Transducer |
| **SW** | — | Switch |
| **T** | — | Thermistor |
| **TB** | — | Terminal Block |
| **TNKR** | — | Storage Tank Heater Relay |
| **TRAN** | — | Transformer |
| | | Terminal Block |
| | | Terminal (Unmarked) |
| | | Terminal (Marked) |
| | | Splice |
| | | Factory Wiring |
| | | Field Wiring |
| | | Accessory or Option Wiring |
| | | To indicate common potential only; not to represent wiring. |

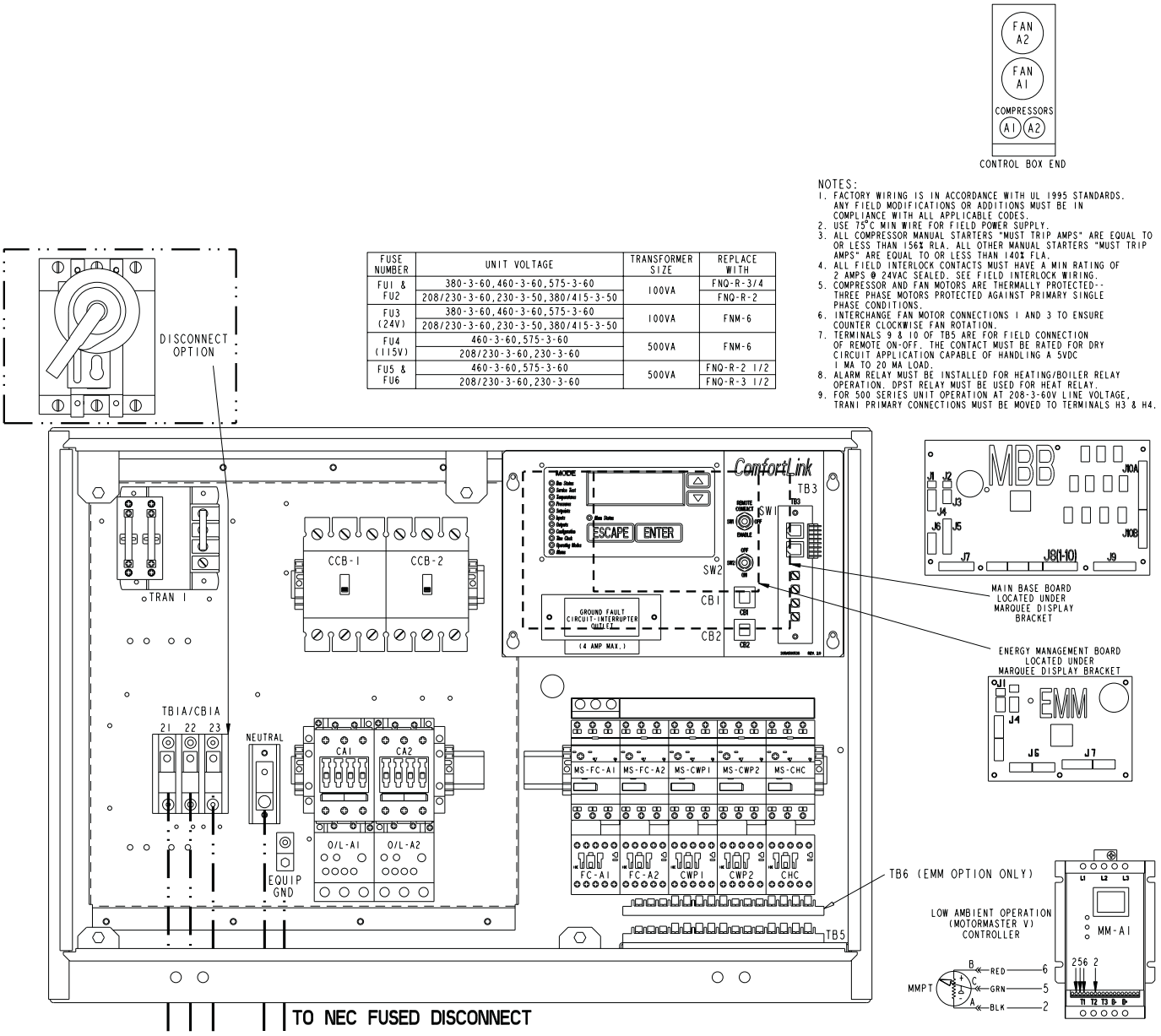



**Fig. 1 — Typical Control Box for 30RA010-030 (022-030 Shown)**

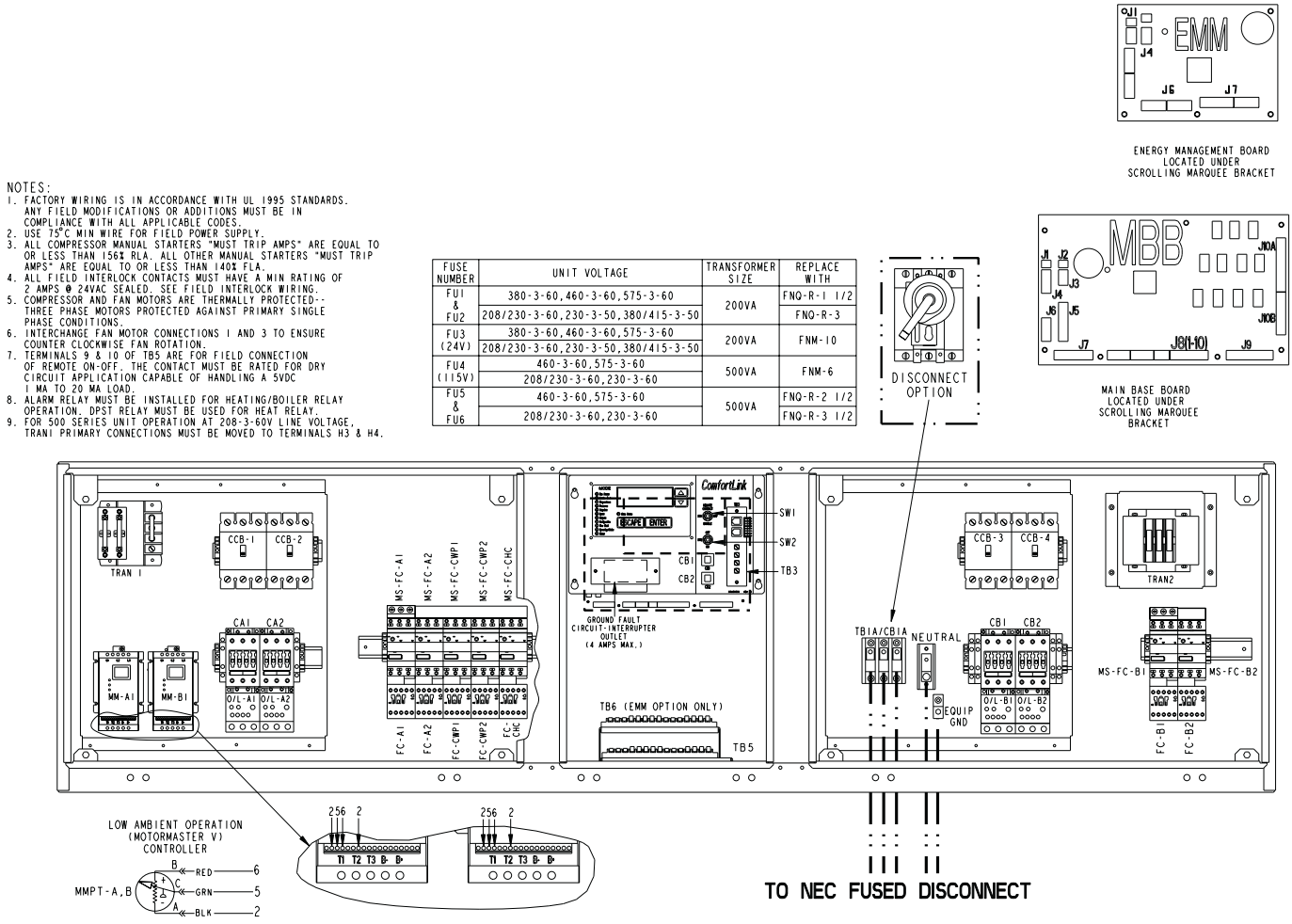
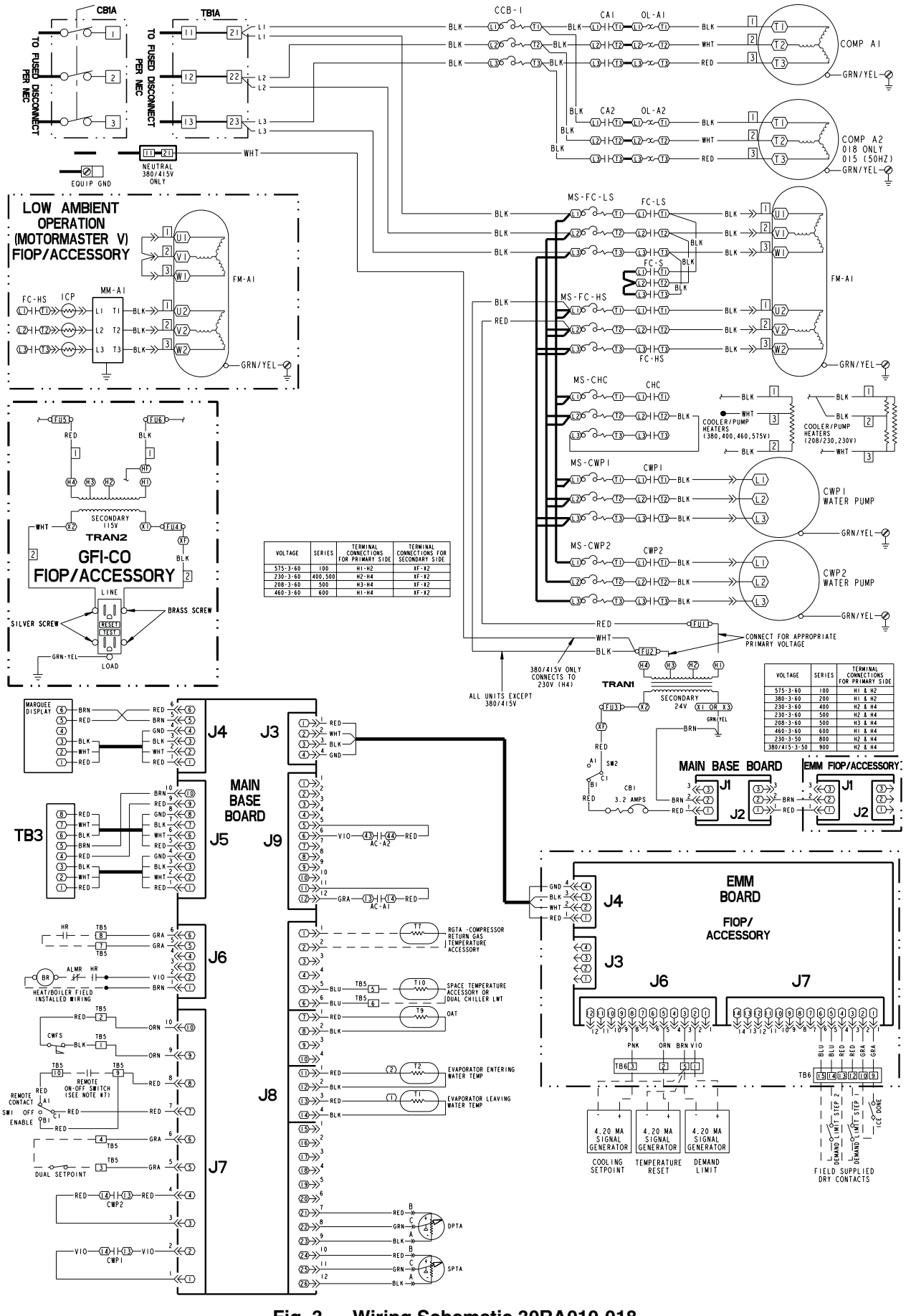



**Fig. 2 — Typical Control Box for 30RA032-055 (042-055 Shown)**

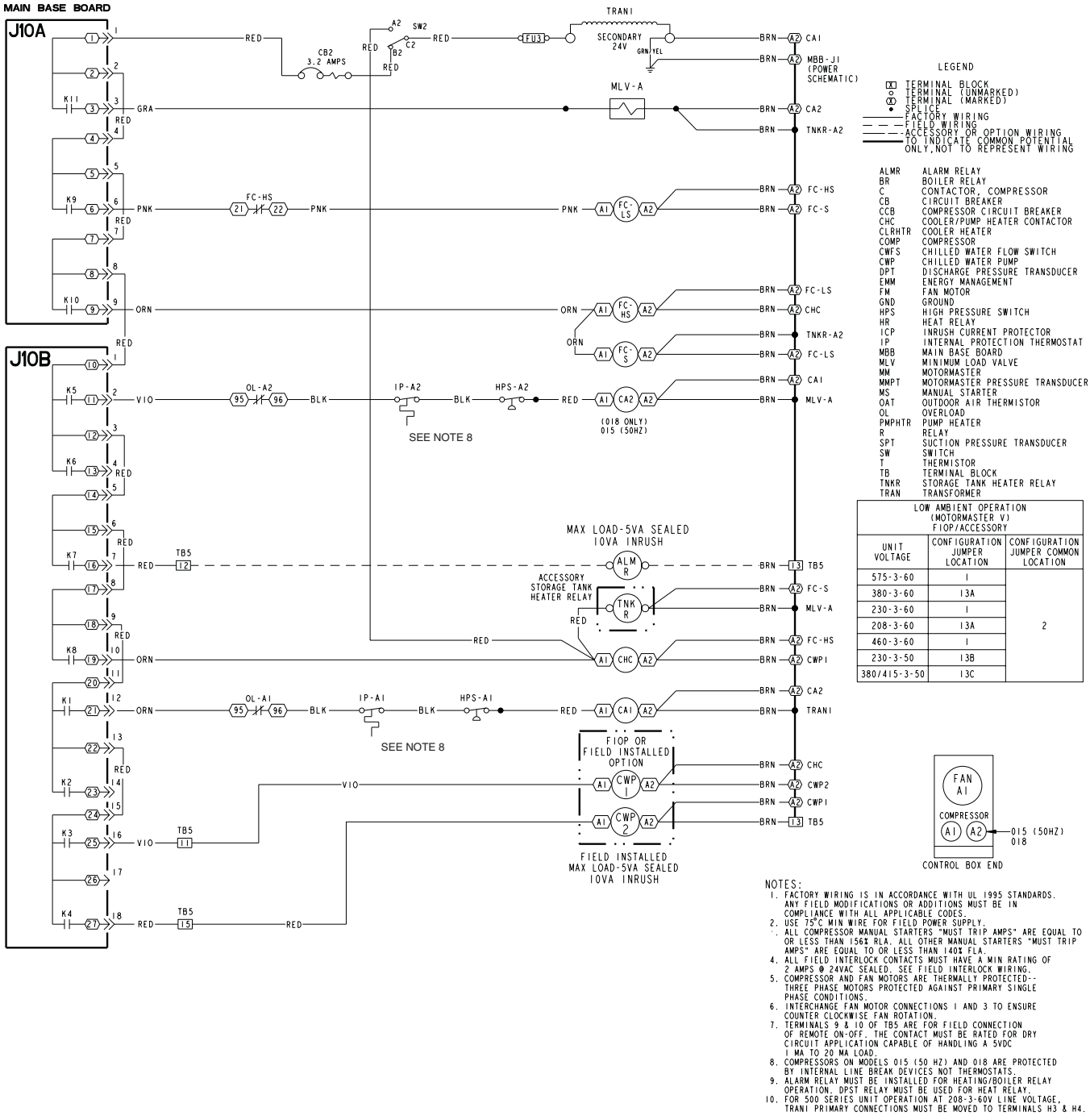



| VOLTAGE | SERIES | TERMINAL CONNECTIONS FOR PRIMARY SIDE | TERMINAL CONNECTIONS FOR SECONDARY SIDE |
|---|---|---|---|
| 575-3-60 | 100 | H1-H2 | XF-X2 |
| 230-3-60 | 400,500 | H2-H4 | XF-X2 |
| 208-3-60 | 500 | H3-H4 | XF-X2 |
| 460-3-60 | 600 | H1-H4 | XF-X2 |

| VOLTAGE | SERIES | TERMINAL CONNECTIONS FOR PRIMARY SIDE |
|---|---|---|
| 575-3-60 | 100 | H1 & H2 |
| 380-3-60 | 200 | H1 & H2 |
| 230-3-60 | 400 | H2 & H4 |
| 230-3-60 | 500 | H2 & H4 |
| 208-3-60 | 500 | H3 & H4 |
| 460-3-60 | 600 | H1 & H4 |
| 230-3-50 | 800 | H2 & H4 |
| 380/415-3-50 | 900 | H2 & H4 |

**Fig. 3 — Wiring Schematic 30RA010-018**

# AQUA-SNAP LOW VOLTAGE CONTROL SCHEMATIC (010-018)




LOW AMBIENT OPERATION (MOTORMASTER V) FIOP/ACCESSORY

| UNIT VOLTAGE | CONFIGURATION JUMPER LOCATION | CONFIGURATION JUMPER COMMON LOCATION |
|---|---|---|
| 575-3-60 | 1 | 2 |
| 380-3-60 | 13A | |
| 230-3-60 | 1 | |
| 208-3-60 | 13A | |
| 460-3-60 | 1 | |
| 230-3-50 | 13B | |
| 380/415-3-50 | 13C | |

**Fig. 3 — Wiring Schematic 30RA010-018 (cont)**

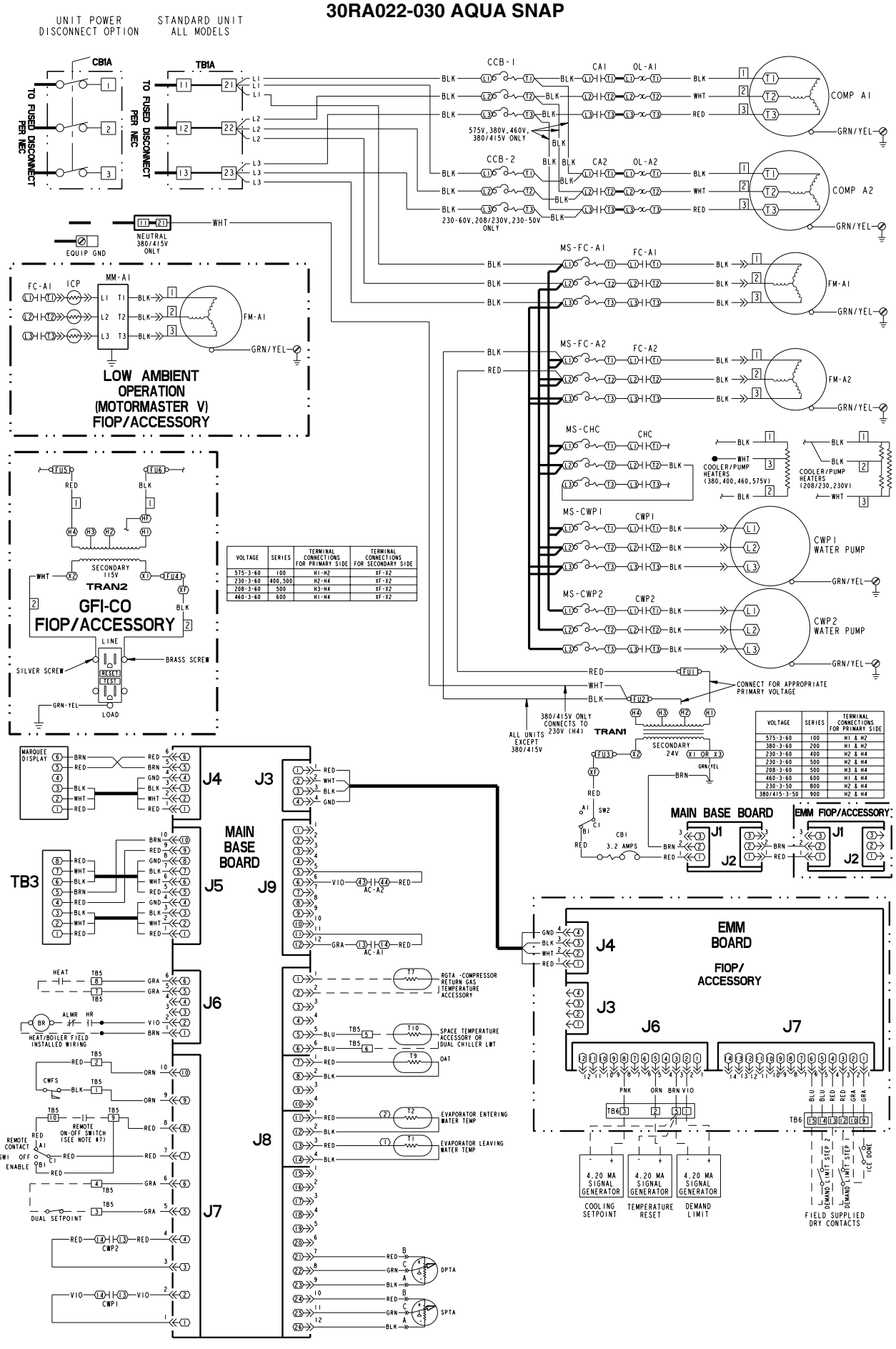
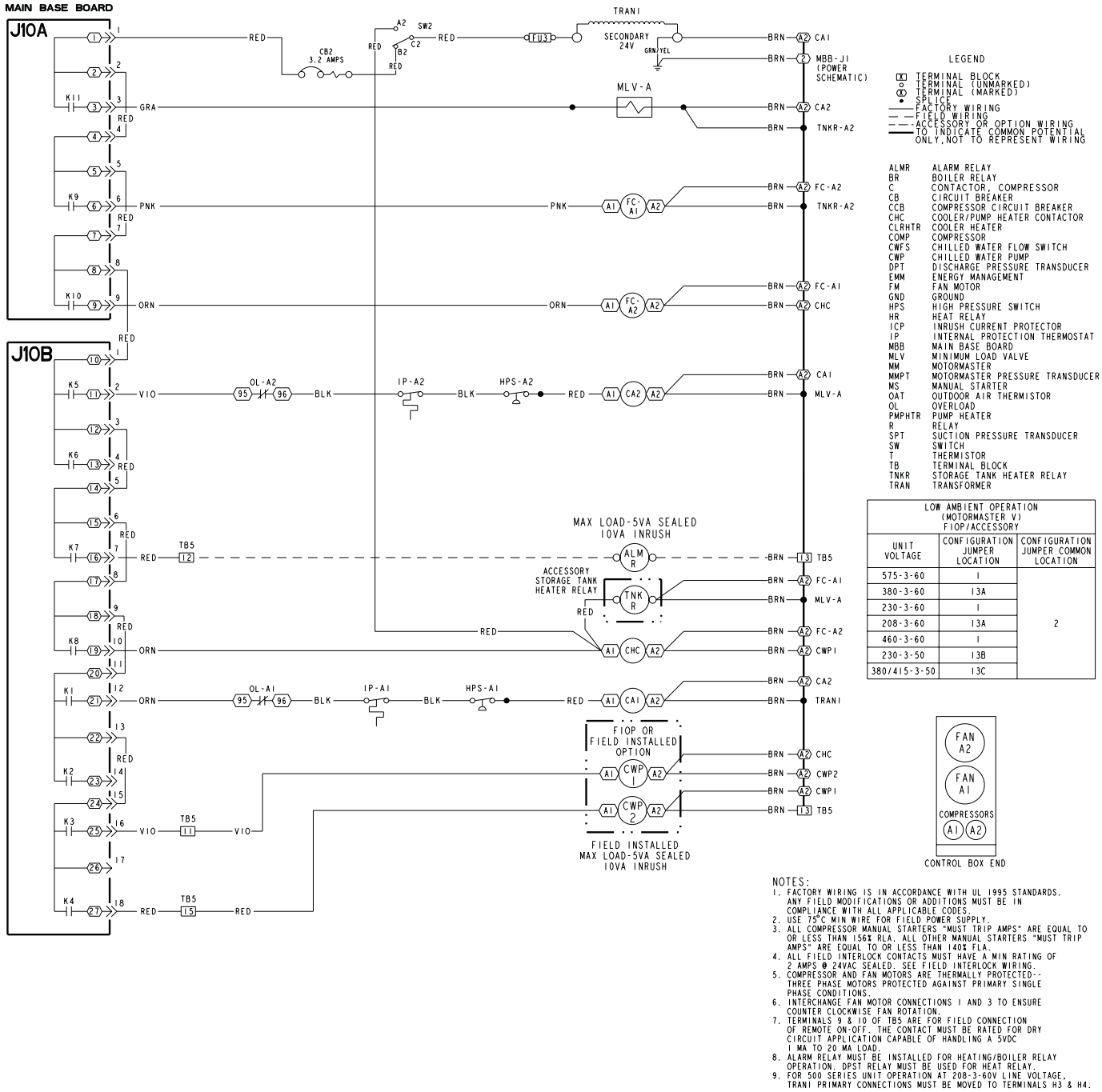



**Fig. 4 — Wiring Schematic 30RA022-030**

# AQUA-SNAP LOW VOLTAGE CONTROL SCHEMATIC (022-030)




LEGEND

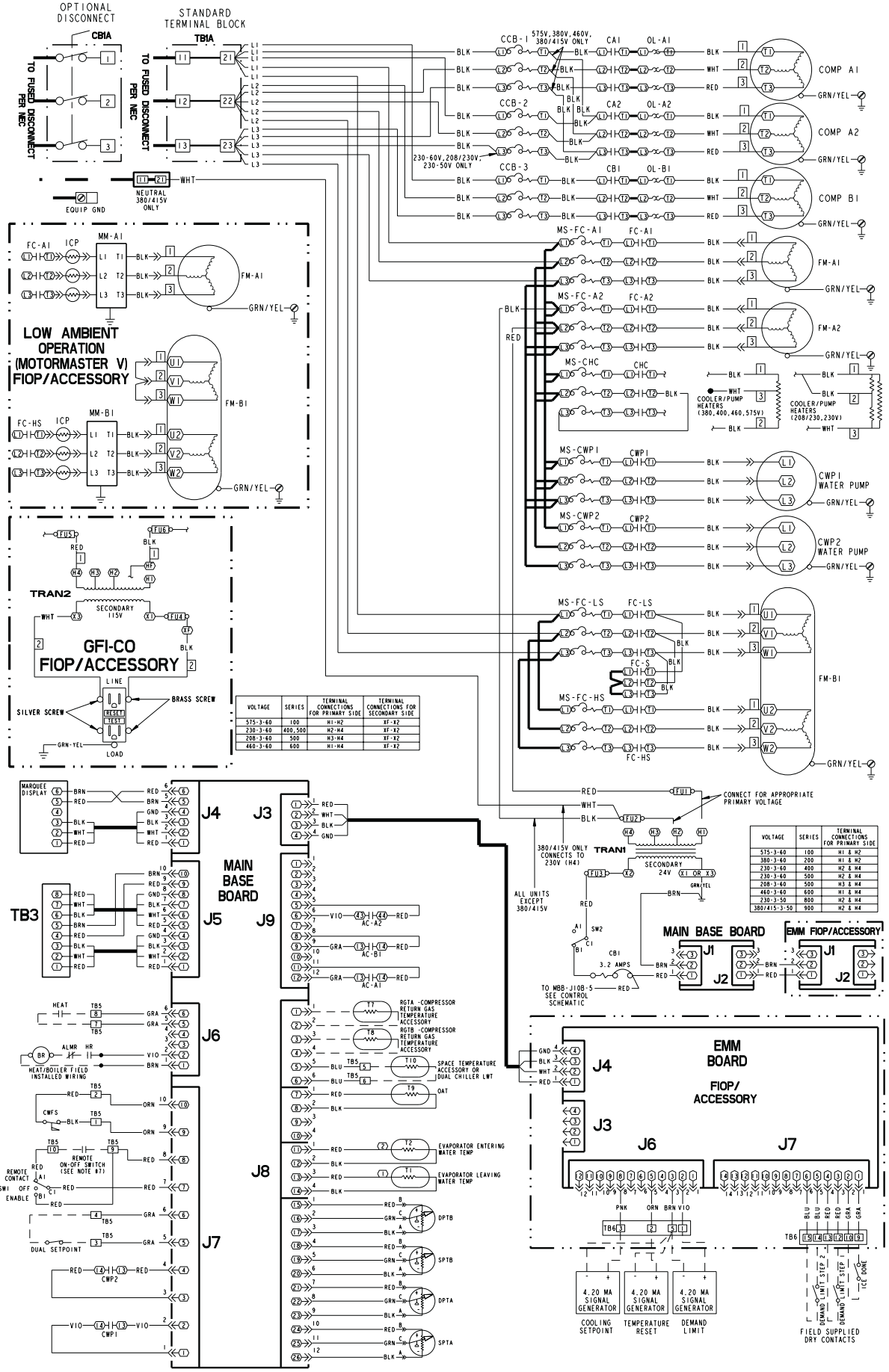
| | |
|---|---|
| | TERMINAL BLOCK |
| | TERMINAL (UNMARKED) |
| | TERMINAL (MARKED) |
| | SPLICE |
| —— | FACTORY WIRING |
| — — | FIELD WIRING |
| — - — | ACCESSORY OR OPTION WIRING |
| —— | TO INDICATE COMMON POTENTIAL ONLY, NOT TO REPRESENT WIRING |

| | |
|---|---|
| ALMR | ALARM RELAY |
| BR | BOILER RELAY |
| C | CONTACTOR, COMPRESSOR |
| CB | CIRCUIT BREAKER |
| CCB | COMPRESSOR CIRCUIT BREAKER |
| CHC | COOLER/PUMP HEATER CONTACTOR |
| CLRHTR | COOLER HEATER |
| COMP | COMPRESSOR |
| CWFS | CHILLED WATER FLOW SWITCH |
| CWP | CHILLED WATER PUMP |
| DPT | DISCHARGE PRESSURE TRANSDUCER |
| EMM | ENERGY MANAGEMENT |
| FM | FAN MOTOR |
| GND | GROUND |
| HPS | HIGH PRESSURE SWITCH |
| HR | HEAT RELAY |
| ICP | INRUSH CURRENT PROTECTOR |
| IP | INTERNAL PROTECTION THERMOSTAT |
| MBB | MAIN BASE BOARD |
| MLV | MINIMUM LOAD VALVE |
| MM | MOTORMASTER |
| MMPT | MOTORMASTER PRESSURE TRANSDUCER |
| MS | MANUAL STARTER |
| OAT | OUTDOOR AIR THERMISTOR |
| OL | OVERLOAD |
| PMPHTR | PUMP HEATER |
| R | RELAY |
| SPT | SUCTION PRESSURE TRANSDUCER |
| SW | SWITCH |
| T | THERMISTOR |
| TB | TERMINAL BLOCK |
| TNKR | STORAGE TANK HEATER RELAY |
| TRAN | TRANSFORMER |

| LOW AMBIENT OPERATION (MOTORMASTER V) FIOP/ACCESSORY | | |
|---|---|---|
| UNIT VOLTAGE | CONFIGURATION JUMPER LOCATION | CONFIGURATION JUMPER COMMON LOCATION |
| 575-3-60 | 1 | |
| 380-3-60 | 13A | |
| 230-3-60 | 1 | |
| 208-3-60 | 13A | 2 |
| 460-3-60 | 1 | |
| 230-3-50 | 13B | |
| 380/415-3-50 | 13C | |

NOTES:
1. FACTORY WIRING IS IN ACCORDANCE WITH UL 1995 STANDARDS. ANY FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
2. USE 75°C MIN WIRE FOR FIELD POWER SUPPLY.
3. ALL COMPRESSOR MANUAL STARTERS "MUST TRIP AMPS" ARE EQUAL TO OR LESS THAN 156% RLA. ALL OTHER MANUAL STARTERS "MUST TRIP AMPS" ARE EQUAL TO OR LESS THAN 140% FLA.
4. ALL FIELD INTERLOCK CONTACTS MUST HAVE A MIN RATING OF 2 AMPS @ 24VAC SEALED. SEE FIELD INTERLOCK WIRING.
5. COMPRESSOR AND FAN MOTORS ARE THERMALLY PROTECTED--THREE PHASE MOTORS PROTECTED AGAINST PRIMARY SINGLE PHASE CONDITIONS.
6. INTERCHANGE FAN MOTOR CONNECTIONS 1 AND 3 TO ENSURE COUNTER CLOCKWISE FAN ROTATION.
7. TERMINALS 9 & 10 OF TB5 ARE FOR FIELD CONNECTION OF REMOTE ON-OFF. THE CONTACT MUST BE RATED FOR DRY CIRCUIT APPLICATION CAPABLE OF HANDLING A 5VDC 1 MA TO 20 MA LOAD.
8. ALARM RELAY MUST BE INSTALLED FOR HEATING/BOILER RELAY OPERATION. DPST RELAY MUST BE USED FOR HEAT RELAY.
9. FOR 500 SERIES UNIT OPERATION AT 208-3-60V LINE VOLTAGE, TRAN1 PRIMARY CONNECTIONS MUST BE MOVED TO TERMINALS H3 & H4.

**Fig. 4 — Wiring Schematic 30RA022-030 (cont)**

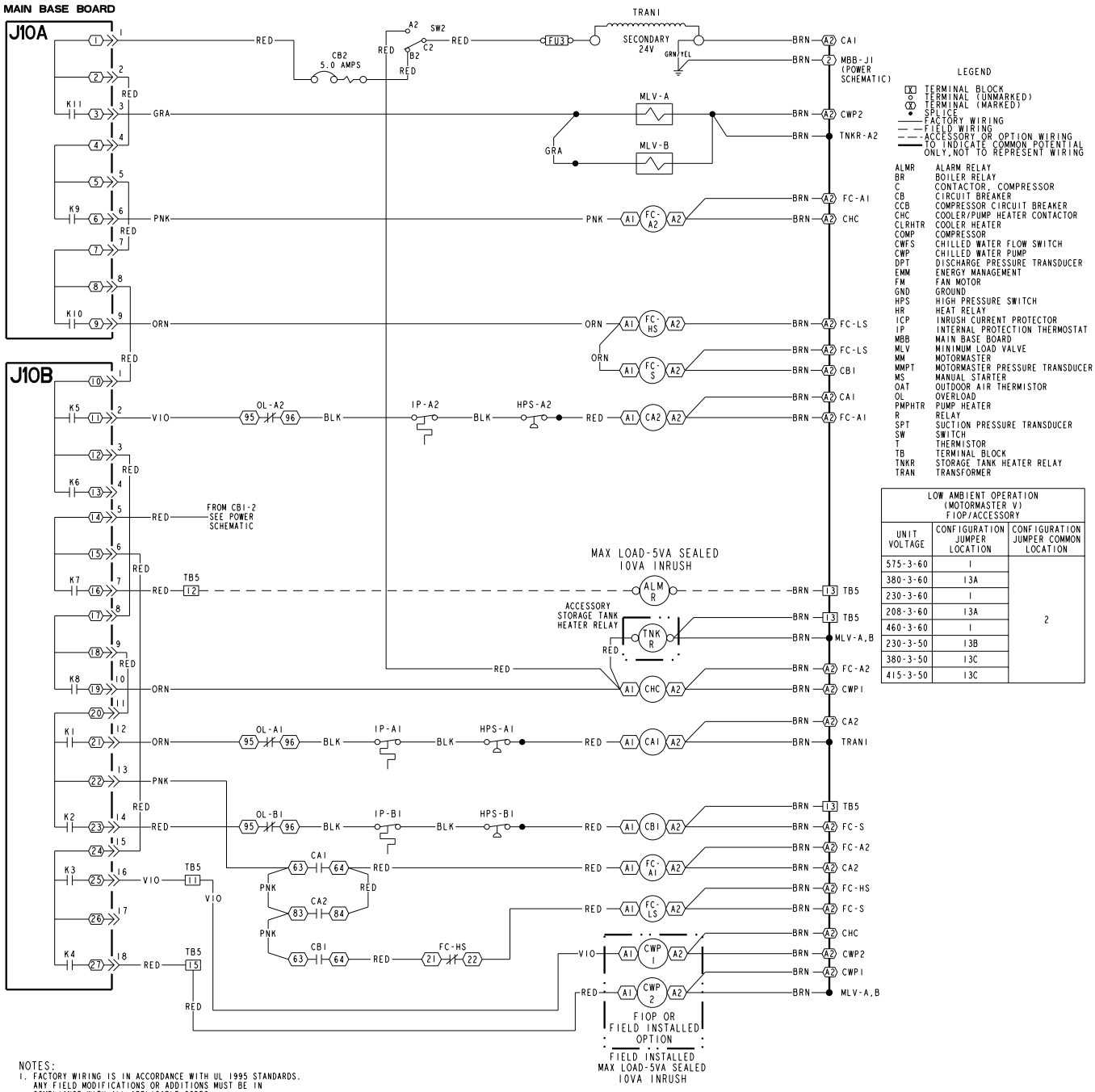



| VOLTAGE | SERIES | TERMINAL CONNECTIONS FOR PRIMARY SIDE | TERMINAL CONNECTIONS FOR SECONDARY SIDE |
|---|---|---|---|
| 575-3-60 | 100 | H1-H2 | X1-X2 |
| 230-3-60 | 400,500 | H2-H4 | X1-X2 |
| 208-3-60 | 500 | H3-H4 | X1-X2 |
| 460-3-60 | 600 | H1-H4 | X1-X2 |

| VOLTAGE | SERIES | TERMINAL CONNECTIONS FOR PRIMARY SIDE |
|---|---|---|
| 575-3-60 | 100 | H1 & H2 |
| 380-3-60 | 200 | H1 & H2 |
| 230-3-60 | 400 | H2 & H4 |
| 230-3-60 | 500 | H2 & H4 |
| 208-3-60 | 500 | H3 & H4 |
| 460-3-60 | 600 | H1 & H4 |
| 230-3-50 | 800 | H2 & H4 |
| 380/415-3-50 | 900 | H2 & H4 |

**Fig. 5 — Wiring Schematic 30RA032-040**

## AQUA-SNAP LOW VOLTAGE CONTROL SCHEMATIC (032-040)




| LOW AMBIENT OPERATION (MOTORMASTER V) FIOP/ACCESSORY | | |
|---|---|---|
| UNIT VOLTAGE | CONFIGURATION JUMPER LOCATION | CONFIGURATION JUMPER COMMON LOCATION |
| 575-3-60 | 1 | 2 |
| 380-3-60 | 13A | |
| 230-3-60 | 1 | |
| 208-3-60 | 13A | |
| 460-3-60 | 1 | |
| 230-3-50 | 13B | |
| 380-3-50 | 13C | |
| 415-3-50 | 13C | |

NOTES:
1. FACTORY WIRING IS IN ACCORDANCE WITH UL 1995 STANDARDS. ANY FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
2. USE 75°C MIN WIRE FOR FIELD POWER SUPPLY.
3. ALL COMPRESSOR MANUAL STARTERS "MUST TRIP AMPS" ARE EQUAL TO OR LESS THAN 156% RLA. ALL OTHER MANUAL STARTERS "MUST TRIP AMPS" ARE EQUAL TO OR LESS THAN 140% FLA.
4. ALL FIELD INTERLOCK CONTACTS MUST HAVE A MIN RATING OF 2 AMPS @ 24VAC SEALED. SEE FIELD INTERLOCK WIRING.
5. COMPRESSOR AND FAN MOTORS ARE THERMALLY PROTECTED-- THREE PHASE MOTORS PROTECTED AGAINST PRIMARY SINGLE PHASE CONDITIONS.
6. INTERCHANGE FAN MOTOR CONNECTIONS 1 AND 3 TO ENSURE COUNTER CLOCKWISE FAN ROTATION.
7. TERMINALS 9 & 10 OF TB5 ARE FOR FIELD CONNECTION OF REMOTE ON-OFF. THE CONTACT MUST BE RATED FOR DRY CIRCUIT APPLICATION CAPABLE OF HANDLING A 5VDC 1 MA TO 20 MA LOAD.
8. ALARM RELAY MUST BE INSTALLED FOR HEATING/BOILER RELAY OPERATION. DPST RELAY MUST BE USED FOR HEAT RELAY.
9. FOR 500 SERIES UNIT OPERATION AT 208-3-60V LINE VOLTAGE, TRAN1 PRIMARY CONNECTIONS MUST BE MOVED TO TERMINALS H3 & H4.

**Fig. 5 — Wiring Schematic 30RA032-040 (cont)**

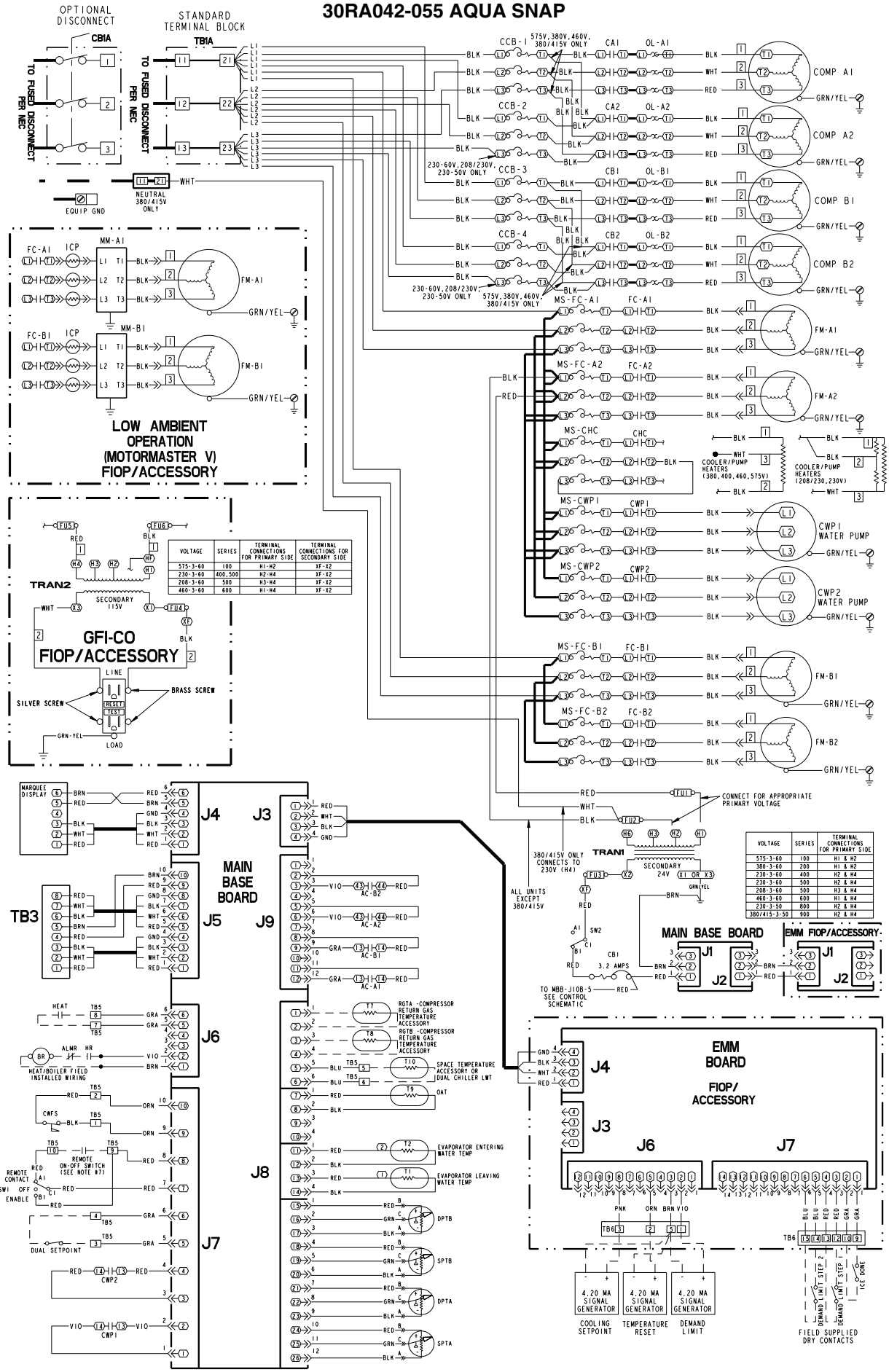
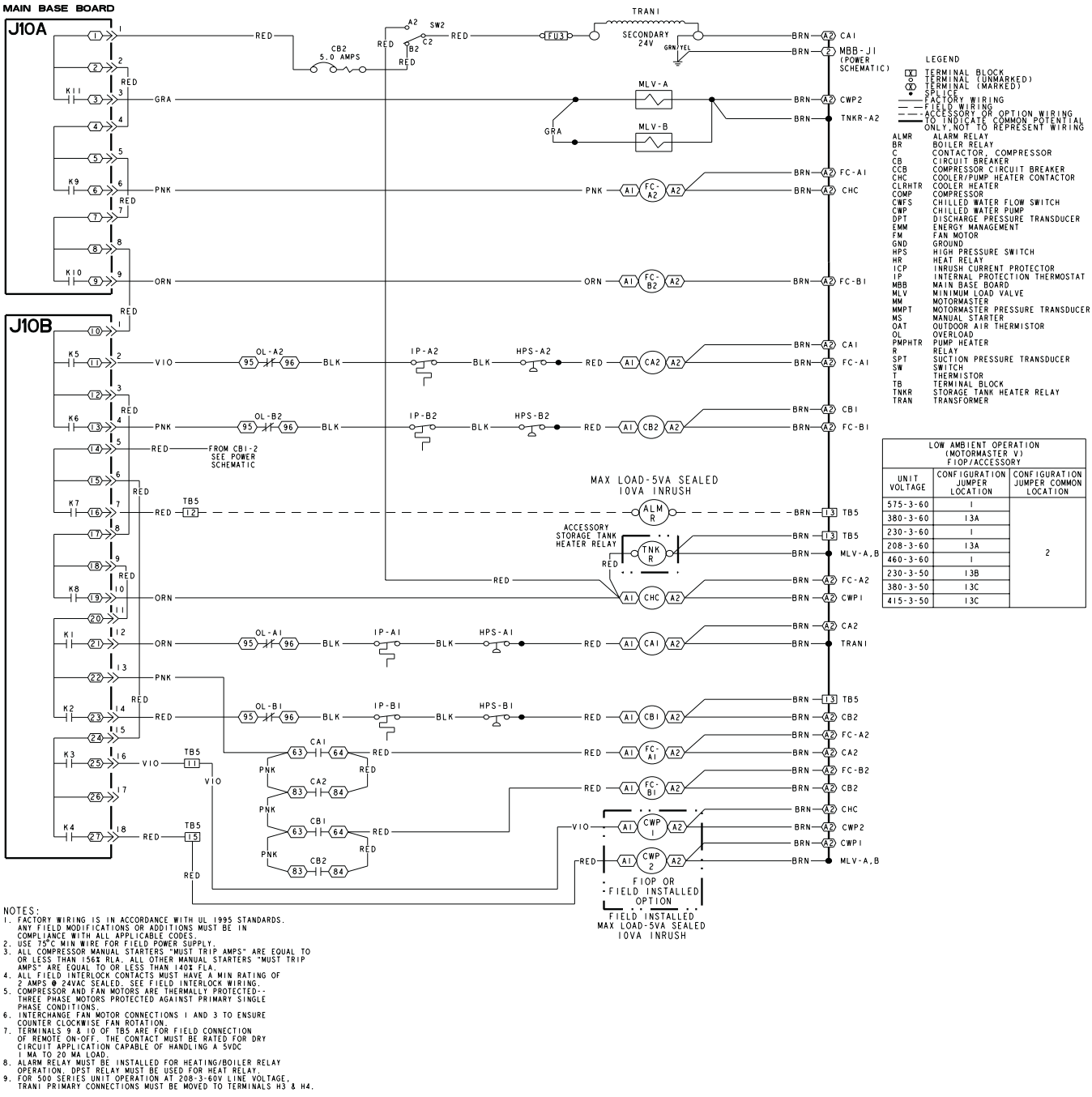



**Fig. 6 — Wiring Schematic 30RA042-055**

# AQUA-SNAP LOW VOLTAGE CONTROL SCHEMATIC (042-055)




| LOW AMBIENT OPERATION (MOTORMASTER V) FIOP/ACCESSORY | | |
|---|---|---|
| UNIT VOLTAGE | CONFIGURATION JUMPER LOCATION | CONFIGURATION JUMPER COMMON LOCATION |
| 575-3-60 | 11 | 2 |
| 380-3-60 | 13A | |
| 230-3-60 | 11 | |
| 208-3-60 | 13A | |
| 460-3-60 | 11 | |
| 230-3-50 | 13B | |
| 380-3-50 | 13C | |
| 415-3-50 | 13C | |

NOTES:
1. FACTORY WIRING IS IN ACCORDANCE WITH UL 1995 STANDARDS. ANY FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
2. USE 75°C MIN WIRE FOR FIELD POWER SUPPLY.
3. ALL COMPRESSOR MANUAL STARTERS "MUST TRIP AMPS" ARE EQUAL TO OR LESS THAN 156% RLA. ALL OTHER MANUAL STARTERS "MUST TRIP AMPS" ARE EQUAL TO OR LESS THAN 140% FLA.
4. ALL FIELD INTERLOCK CONTACTS MUST HAVE A MIN RATING OF 2 AMPS @ 24VAC SEALED. SEE FIELD INTERLOCK WIRING.
5. COMPRESSOR AND FAN MOTORS ARE THERMALLY PROTECTED--THREE PHASE MOTORS PROTECTED AGAINST PRIMARY SINGLE PHASE CONDITIONS.
6. INTERCHANGE FAN MOTOR CONNECTIONS 1 AND 3 TO ENSURE COUNTER CLOCKWISE FAN ROTATION.
7. TERMINALS 9 & 10 OF TB5 ARE FOR FIELD CONNECTION OF REMOTE ON-OFF. THE CONTACT MUST BE RATED FOR DRY CIRCUIT APPLICATION CAPABLE OF HANDLING A 5VDC 1 MA TO 20 MA LOAD.
8. ALARM RELAY MUST BE INSTALLED FOR HEATING/BOILER RELAY OPERATION. DPST RELAY MUST BE USED FOR HEAT RELAY.
9. FOR 500 SERIES UNIT OPERATION AT 208-3-60V LINE VOLTAGE, TRAN1 PRIMARY CONNECTIONS MUST BE MOVED TO TERMINALS H3 & H4.

**Fig. 6 — Wiring Schematic 30RA042-055 (cont)**

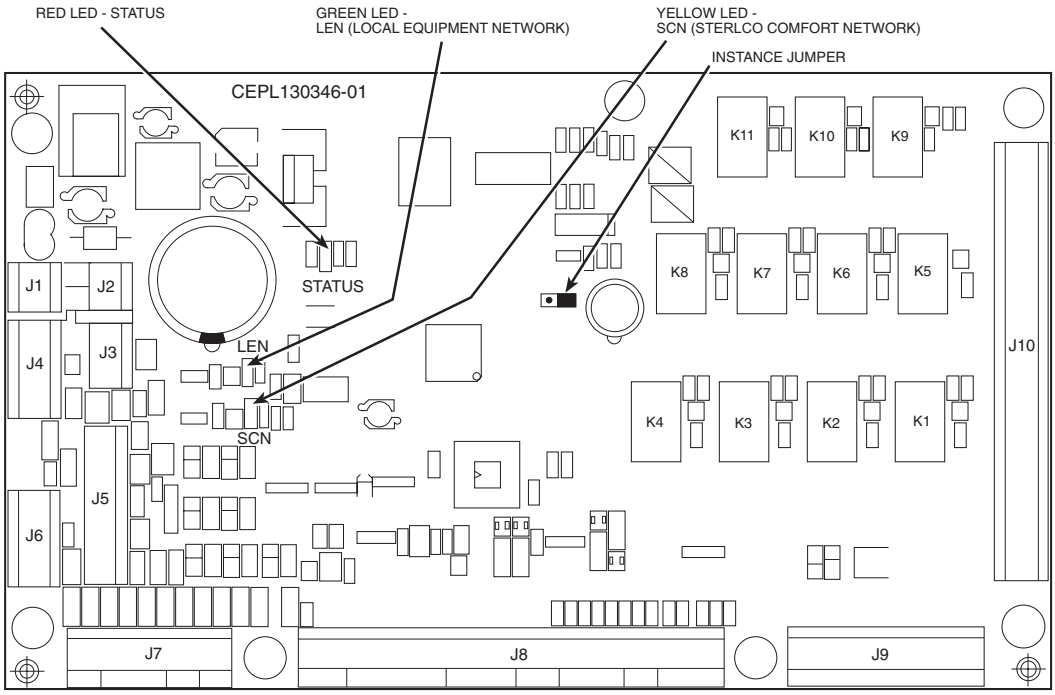



**Fig. 7 — Main Base Board**

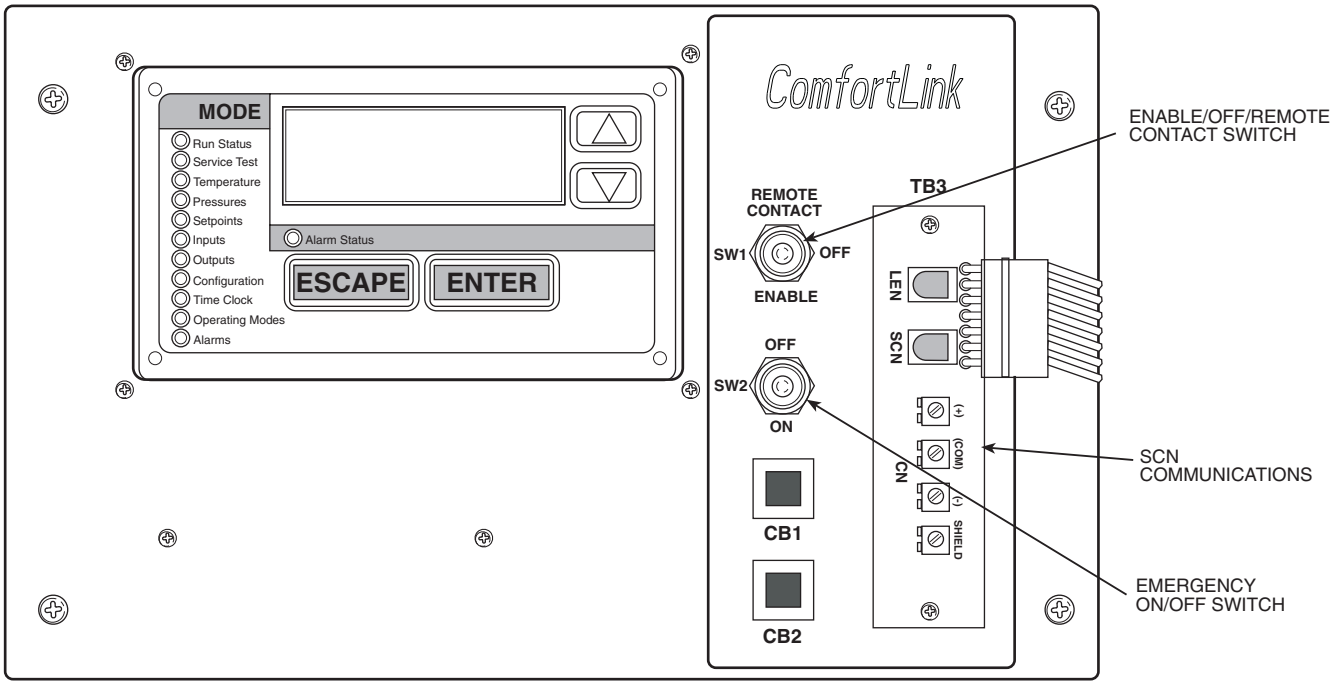



**Fig. 8 — LEN/SCN Interface, Enable/Off/Remote Contact Switch, and Emergency On/Off Switch Locations**

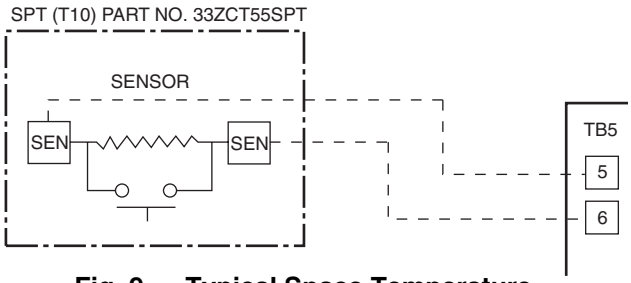



**Fig. 9 — Typical Space Temperature Sensor Wiring**

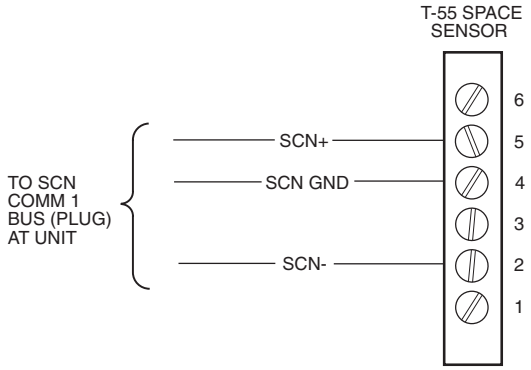



**Fig. 10 — SCN Communications Bus Wiring to Optional Space Sensor RJ11 Connector**

**Energy Management Module (Fig. 11) —** This factory-installed option (FIOP) or field-installed accessory is used for the following types of temperature reset, demand limit, and/or ice features:

- 4 to 20 mA leaving fluid temperature reset (requires field-supplied 4 to 20 mA generator)
- 4 to 20 mA cooling set point reset (requires field-supplied 4 to 20 mA generator)
- Discrete inputs for 2-step demand limit (requires field-supplied dry contacts capable of handling a 24 vac, 50 mA load)
- 4 to 20 mA demand limit (requires field-supplied 4 to 20 mA generator)
- Discrete input for Ice Done switch (requires field-supplied dry contacts capable of handling a 24 vac, 50 mA load)

See Demand Limit and Temperature Reset sections on pages 44 and 43 for further details.

**⚠ CAUTION**

Care should be taken when interfacing with other manufacturer's control systems due to possible power supply differences, full wave bridge versus half wave rectification. The two different power supplies cannot be mixed. *Comfort*Link™ controls use half wave rectification. A signal isolation device should be utilized if a full wave bridge signal generating device is used.

**Loss-of-Cooler Flow Protection —** A proof-of-cooler flow device is factory installed in all chillers. It is recommended that proper operation of the switch be verified on a regular basis.

**Thermostatic Expansion Valves (TXV) —** All units are equipped from the factory with conventional TXVs. Each refrigeration circuit is also supplied with a factory-installed liquid line filter drier and sight glass.

The TXV is set at the factory to maintain approximately 8 to 12° F (4.4 to 6.7° C) suction superheat leaving the cooler by metering the proper amount of refrigerant into the cooler. All TXVs are adjustable, *but should not be adjusted unless absolutely necessary.*

The TXV is designed to limit the cooler saturated suction temperature to 55 F (12.8 C). This makes it possible for unit to start at high cooler fluid temperatures without overloading the compressor.

**Capacity Control —** The control system cycles compressors, and minimum load valve solenoids (if equipped) to maintain the user-configured leaving chilled fluid temperature set point. Entering fluid temperature is used by the Main Base Board (MBB) to determine the temperature drop across the cooler and is used in determining the optimum time to add or subtract capacity stages. The chilled fluid temperature set point can be automatically reset by the return fluid temperature, space, or outdoor-air temperature reset features. It can also be reset from an external 4 to 20-mA signal (requires Energy Management Module FIOP or accessory).

The control has an automatic lead-lag feature built in which determines the wear factor (combination of starts and run hours) for each compressor. If all compressors are off and less than 30 minutes has elapsed since the last compressor was turned off, the wear factor is used to determine which compressor to start next. If no compressors have been running for more than 30 minutes and the leaving fluid temperature is greater than the saturated condensing temperature, the wear factor is still used to determine which compressor to start next. If the leaving fluid temperature is less than the saturated condensing temperature, then the control will start either compressor A1 or compressor B1 first, depending on the user-configurable circuit lead-lag value.

The TXVs will provide a controlled start-up. During start-up, the low pressure logic will be bypassed for $2^1/_2$ minutes to allow for the transient changes during start-up. As additional stages of compression are required, the processor control will add them. See Table 6 and 7.

If a circuit is to be stopped, the compressor with the lowest wear factor will be shut off first in most cases. Certain override conditions may shut off the smaller of two compressors on a circuit first.

The capacity control algorithm runs every 30 seconds. The algorithm attempts to maintain the Control Point at the desired set point. Each time it runs, the control reads the entering and leaving fluid temperatures. The control determines the rate at which conditions are changing and calculates 2 variables based on these conditions. Next, a capacity ratio is calculated using the 2 variables to determine whether or not to make any changes to the current stages of capacity. This ratio value ranges from –100 to +100%. If the next stage of capacity is a compressor, the control starts (stops) a compressor when the ratio reaches +100% (–100%). If installed, the minimum load valve solenoid will be energized with the first stage of capacity. Minimum load valve value is a fixed 30% in the total capacity calculation. The control will also use the minimum load valve solenoid as the last stage of capacity before turning off the last compressor. If the close control feature (CLS.C) [Configuration, OPT2] is enabled the control will use the minimum load valve solenoid whenever possible to fine tune leaving fluid temperature control. A delay of 90 seconds occurs after each capacity step change. Refer to Tables 6 and 7.

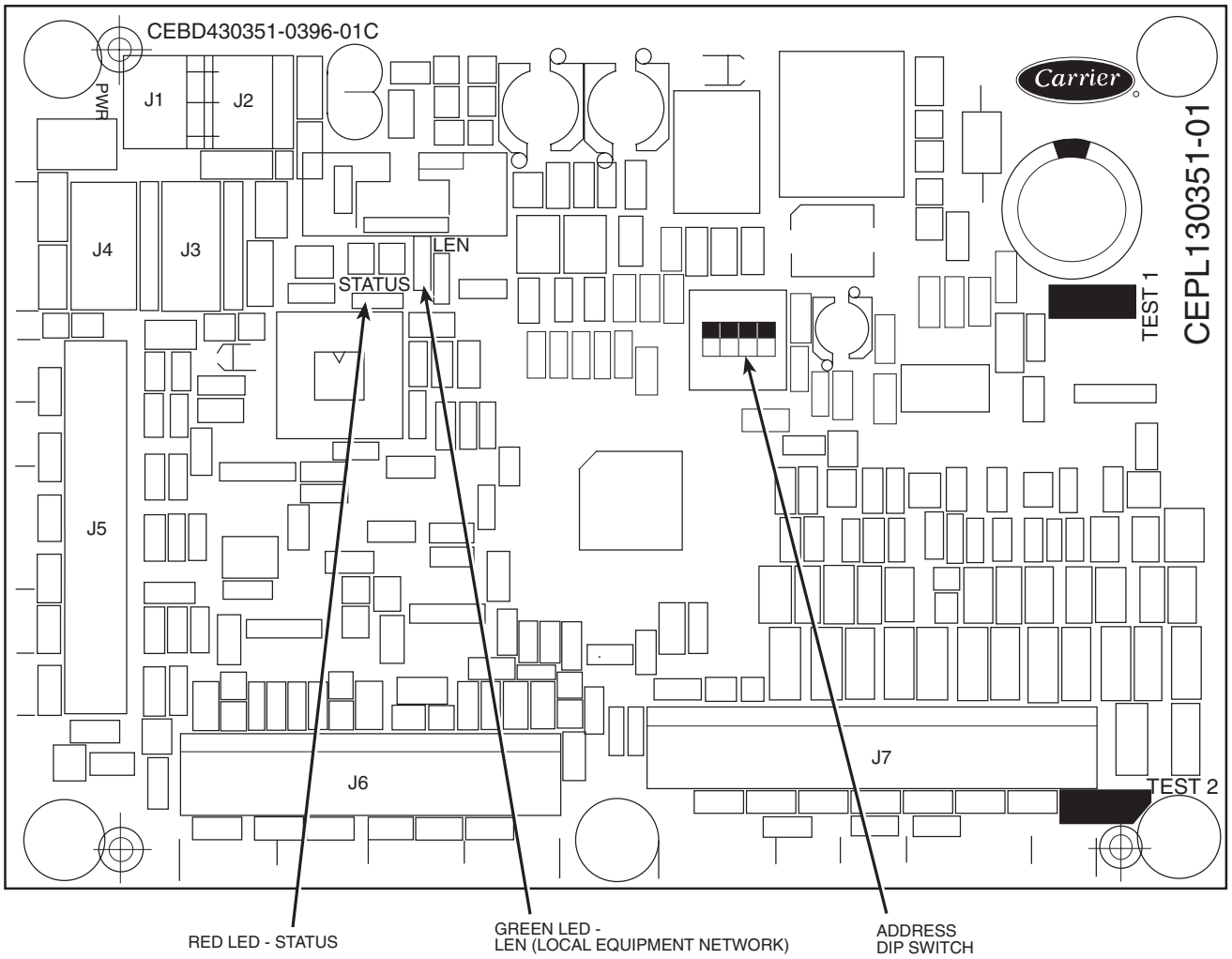



**Fig. 11 — Energy Management Module**

**Table 6 — Part Load Data Percent Displacement, Standard Units without Minimum Load Valve**

| 30RA UNIT SIZE | CONTROL STEPS | LOADING SEQ A | | LOADING SEQ B | |
|---|---|---|---|---|---|
| | | % Displacement | Compressor | % Displacement | Compressor |
| 010,015 (60 Hz) | 1 | 100 | A1 | — | — |
| 015 (50 Hz), 018 | 1<br>2 | 50<br>100 | A1<br>A1,A2 | —<br>— | —<br>— |
| 022 (60 Hz) | 1<br>2 | 42<br>100 | A1<br>A1, A2 | —<br>— | —<br>— |
| 022 (50 Hz), 025, 030 | 1<br>2 | 50<br>100 | A1<br>A1,A2 | —<br>— | —<br>— |
| 032, 035 (60 Hz) | 1<br>2<br>3 | 25<br>60<br>100 | A1<br>A1,A2<br>A1,A2,B1 | 40<br>65<br>100 | B1<br>A1,B1<br>A1,A2,B1 |
| 035 (50 Hz) | 1<br>2<br>3 | 33<br>67<br>100 | A1<br>A1, A2<br>A1, A2, B1 | 33<br>67<br>100 | B1<br>A1, B1<br>A1, A2, B1 |
| 040 | 1<br>2<br>3 | 32<br>63<br>100 | A1<br>A1, A2<br>A1, A2, B1 | 37<br>68<br>100 | B1<br>A1, B1<br>A1, A2, B1 |
| 042, 045 (50 Hz), 050, 055 | 1<br>2<br>3<br>4 | 25<br>50<br>75<br>100 | A1<br>A1,B1<br>A1,A2,B1<br>A1,A2,B1,B2 | 25<br>50<br>75<br>100 | B1<br>A1,B1<br>A1,B1,B2<br>A1,A2,B1,B2 |
| 045 (60 Hz) | 1<br>2<br>3<br>4 | 22<br>44<br>72<br>100 | A1<br>A1,B1<br>A1,A2,B1<br>A1,A2,B1,B2 | 22<br>44<br>72<br>100 | B1<br>A1,B1<br>A1,B1,B2<br>A1,A2,B1,B2 |

NOTE: These capacity steps may vary due to different capacity staging sequences.

## Table 7 — Part Load Data Percent Displacement, Standard Units with Minimum Load Valve

| 30RA UNIT SIZE | CONTROL STEPS | LOADING SEQ A | | LOADING SEQ B | |
|---|---|---|---|---|---|
| | | % Displacement | Compressor | % Displacement | Compressor |
| **010 (50/60 Hz)** | 1<br>2 | 69/ 71<br>100/100 | A1*<br>A1 | —<br>— | —<br>— |
| **015 (60 Hz)** | 1<br>2 | 79<br>100 | A1*<br>A1 | —<br>— | —<br>— |
| **015 (50 Hz)** | 1<br>2<br>3 | 28<br>50<br>100 | A1*<br>A1<br>A1,A2 | —<br>—<br>— | —<br>—<br>— |
| **018 (50/60 Hz)** | 1<br>2<br>3 | 32/ 31<br>50/ 50<br>100/100 | A1*<br>A1<br>A1,A2 | —<br>—<br>— | —<br>—<br>— |
| **022 (50/60 Hz)** | 1<br>2<br>3 | 27/ 35<br>42/ 50<br>100/100 | A1*<br>A1<br>A1,A2 | —<br>—<br>— | —<br>—<br>— |
| **025 (50/60 Hz)** | 1<br>2<br>3 | 38/ 37<br>50/ 50<br>100/100 | A1*<br>A1<br>A1,A2 | —<br>—<br>— | —<br>—<br>— |
| **030** | 1<br>2<br>3 | 39<br>50<br>100 | A1*<br>A1<br>A1,A2 | —<br>—<br>— | —<br>—<br>— |
| **032** | 1<br>2<br>3<br>4 | 15<br>25<br>60<br>100 | A1*<br>A1<br>A1,A2<br>A1,A2,B1 | 30<br>40<br>65<br>100 | B1*<br>B1<br>A1,B1<br>A1,A2,B1 |
| **035 (50/60 Hz)** | 1<br>2<br>3<br>4 | 16/25<br>25/33<br>60/67<br>100 | A1*<br>A1<br>A1,A2<br>A1,A2,B1 | 32/25<br>40/33<br>65/67<br>100 | B1*<br>B1<br>A1,B1<br>A1,A2,B1 |
| **040** | 1<br>2<br>3<br>4 | 24<br>32<br>63<br>100 | A1*<br>A1<br>A1,A2<br>A1,A2,B1 | 29<br>37<br>68<br>100 | B1*<br>B1<br>A1,B1<br>A1,A2,B1 |
| **042** | 1<br>2<br>3<br>4<br>5 | 18<br>25<br>50<br>75<br>100 | A1*<br>A1<br>A1,B1<br>A1,A2,B1<br>A1,A2,B1,B2 | 18<br>25<br>50<br>75<br>100 | B1*<br>B1<br>A1,B1<br>A1,B1,B2<br>A1,A2,B1,B2 |
| **045 (60 Hz)** | 1<br>2<br>3<br>4<br>5 | 15<br>22<br>44<br>72<br>100 | A1*<br>A1<br>A1,B1<br>A1,A2,B1<br>A1,A2,B1,B2 | 15<br>22<br>44<br>72<br>100 | B1*<br>B1<br>A1,B1<br>A1,B1,B2<br>A1,A2,B1,B2 |
| **045 (50 Hz), 050** | 1<br>2<br>3<br>4<br>5 | 19<br>25<br>50<br>77<br>100 | A1*<br>A1<br>A1,B1<br>A1,A2,B1<br>A1,A2,B1,B2 | 19<br>25<br>50<br>77<br>100 | B1*<br>B1<br>A1,B1<br>A1,B1,B2<br>A1,A2,B1,B2 |
| **055** | 1<br>2<br>3<br>4<br>5 | 20<br>25<br>50<br>75<br>100 | A1*<br>A1<br>A1,B1<br>A1,A2,B1<br>A1,A2,B1,B2 | 20<br>25<br>50<br>75<br>100 | B1*<br>B1<br>A1,B1<br>A1,B1,B2<br>A1,A2,B1,B2 |

*Minimum Load Valve energized.

NOTE: These capacity steps may vary due to different capacity staging sequences.

MINUTES LEFT FOR START — This value is displayed only in the network display tables (using Service Tool, ComfortVIEW™ or ComfortWORKS® software) and represents the amount of time to elapse before the unit will start its initialization routine. This value can be zero without the machine running in many situations. This can include being unoccupied, ENABLE/OFF/REMOTE CONTACT switch in the OFF position, SCN not allowing unit to start, Demand Limit in effect, no call for cooling due to no load, and alarm or alert conditions present. If the machine should be running and none of the above are true, a minimum off time (DELY, see below) may be in effect. The machine should start normally once the time limit has expired.

MINUTES OFF TIME (DELY) [Configuration OPT2] — This user-configurable time period is used by the control to determine how long unit operation is delayed after power is applied/restored to the unit. Typically, this time period is configured when multiple machines are located on a single site. For example, this gives the user the ability to prevent all the units from restarting at once after a power failure. A value of zero for this variable does not mean that the unit should be running.

LEAD/LAG DETERMINATION — This is a configurable choice and is factory set to be automatic for all units. The value can be changed to Circuit A or Circuit B leading as desired. Set at automatic, the control will sum the current number of logged circuit starts and one-quarter of the current operating hours for each circuit. The circuit with the lowest sum is started first. Changes to which circuit is the lead circuit and which is the lag are also made when total machine capacity is at 100% or when there is a change in the direction of capacity (increase or decrease) and each circuit's capacity is equal.

CAPACITY CONTROL OVERRIDES — The following overrides will modify the normal operation of the routine.

Deadband Multiplier — The user configurable Deadband Multiplier (Z.GN) [Configuration, SLCT] has a default value of 1.0. The range is from 1.0 to 4.0. When set to other than 1.0, this factor is applied to the capacity Load/Unload Factor. The larger this value is set, the longer the control will delay between adding or removing stages of capacity. Figure 12 shows how compressor starts can be reduced over time if the leaving water temperature is allowed to drift a larger amount above and below the set point. This value should be set in the range of 3.0 to 4.0 for systems with small loop volumes.

First Stage Override — If the current capacity stage is zero, the control will modify the routine with a 1.2 factor on adding the first stage to reduce cycling. This factor is also applied when the control is attempting to remove the last stage of capacity.

Slow Change Override — The control prevents the capacity stages from being changed when the leaving fluid temperature is close to the set point (within an adjustable deadband) and moving towards the set point.

Ramp Loading (CRMP) [Configuration, SLCT] — Limits the rate of change of leaving fluid temperature. If the unit is in a Cooling mode and configured for Ramp Loading, the control makes 2 comparisons before deciding to change stages of capacity. The control calculates a temperature difference between the control point and leaving fluid temperature. If the difference is greater than 4 °F (2.2 °C) and the rate of change (°F or °C per minute) is more than the configured Cooling Ramp Loading value (CRMP), the control does not allow any changes to the current stage of capacity.

Low Entering Fluid Temperature Unloading — When the entering fluid temperature is below the control point, the control will attempt to remove 25% of the current stages being used. If exactly 25% cannot be removed, the control removes an amount greater than 25% but no more than necessary. The lowest stage will not be removed.

Minimum Load Control — If equipped, the minimum load control valve is energized only when one compressor in the circuit is running. If the close control feature is enabled the minimum load control valve may be used as needed to obtain leaving fluid temperature close to set point.

Cooler Freeze Protection — The control will try to prevent shutting the chiller down on a Cooler Freeze Protection alarm by removing stages of capacity. If the cooler fluid selected is Water, the freeze point is 34 F (1.1 C). If the cooler fluid selected is Brine, the freeze point is the Brine freeze Point (BR.FZ) [Set Points, FRZ]. This alarm condition (A207) only references leaving fluid temperature and NOT Brine Freeze point. If the cooler leaving fluid temperature is less than the freeze point plus 2.0° F (1.1° C), the control will immediately remove one stage of capacity. This can be repeated once every 30 seconds.

Low Saturated Suction Protection — The control will try to prevent shutting a circuit down due to low saturated suction conditions by removing stages of capacity. These circuit alert conditions (T116, T117) compare saturated suction temperature to the configured Brine Freeze point (BR.FZ) [Set Points, FRZ]. The Brine Freeze point is a user-configurable value that must be left at 34 F (1.1 C) for 100% water systems. A lower value may be entered for systems with brine solutions, but this value should be set according to the freeze protection level of the brine mixture. Failure to properly set this brine freeze point value may permanently damage the brazed plate heat exchanger. The control will initiate Mode 7 (Circuit A) or Mode 8 (Circuit B) to indicate a circuit's capacity is limited and that eventually the circuit may shut down.

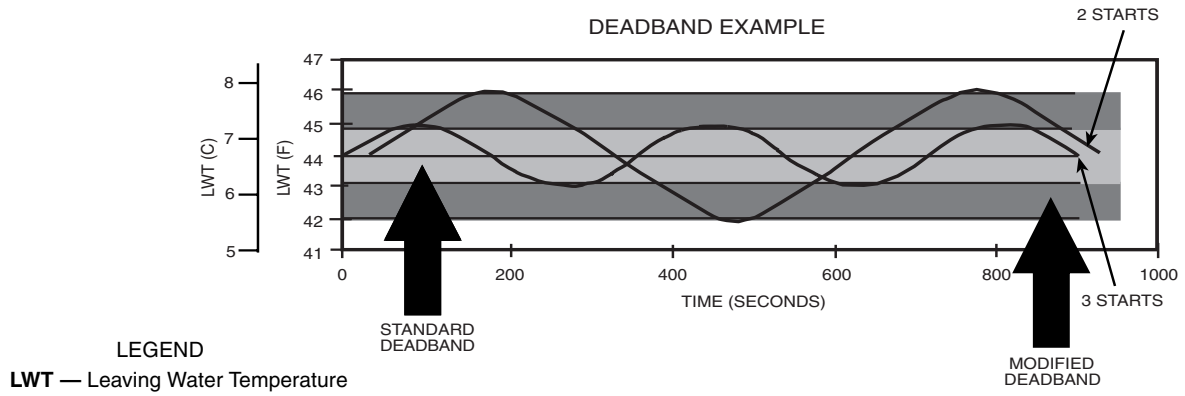
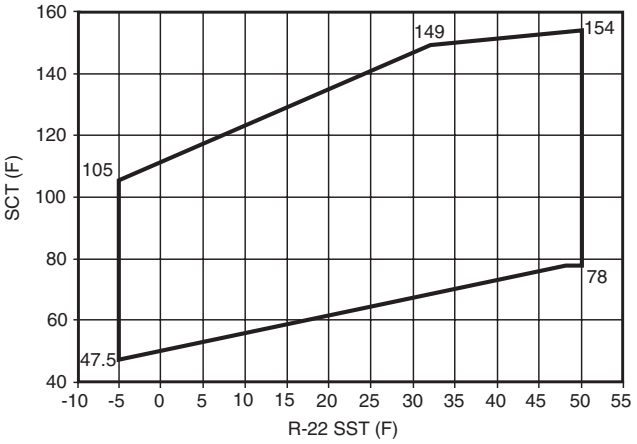



**Fig. 12 — Deadband Multiplier**

**Head Pressure Control —** The Main Base Board (MBB) controls the condenser fans to maintain the lowest condensing temperature possible, and thus the highest unit efficiency. The MBB uses the saturated condensing temperature input from the discharge pressure transducer to control the fans. Head pressure control is maintained through a calculated set point which is automatically adjusted based on actual saturated condensing and saturated suction temperatures so that the compressor(s) is (are) always operating within the manufacturer's specified envelope (see Fig. 13). The control will automatically reduce the unit capacity as the saturated condensing temperature approaches an upper limit. The control will indicate through an alert that a high ambient unloading mode is in effect. If the saturated condensing temperature in a circuit exceeds the calculated maximum, the circuit will be stopped. For these reasons, there are no head pressure control methods or set points to enter. If the saturated condensing temperature in a circuit is greater than or equal to 95 F (35 C) at start-up, all available condenser fans will be started to prevent excessive discharge pressure during pull-down. The control will turn off a fan stage when the condensing temperature has been below the calculated head pressure set point by 35 F (19.4 C) for more than 2 minutes. Fan sequences are shown in Fig. 14.




LEGEND

**SCT** — Saturated Condensing Temperature
**SST** — Saturated Suction Temperature

**Fig. 13 — Operating Envelope for R-22 Maneurop Compressor**

MOTORMASTER® V OPTION — For low-ambient operation, the lead fan on a circuit can be equipped with the Motormaster V head pressure controller option or accessory. The control will automatically raise the head pressure set point by 5 F (2.8 C) when Motormaster control is configured. The controller is energized with the first fan stage and adjusts fan speed to maintain a liquid pressure of 135 psig (931 kPa). For sizes 010-018 and Circuit B of sizes 032-040, the two-speed fan is wired for high speed operation and the Motormaster V controller adjusts fan speed. For size 022-030, 042-055 and circuit A of the 032-040 sizes, the lead fan (A1 or B1) in the circuit is controlled. Refer to Fig. 14 for condenser fan staging information. Refer to Fig. 15 for typical pressure transducer location.

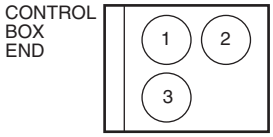
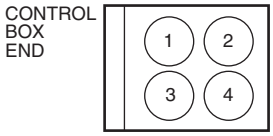
| FAN ARRANGEMENT | FAN NO. | FAN RELAY | NORMAL CONTROL |
|---|---|---|---|
| **30RAN010-018** | 1 | FC-LS | Energize Fan at Low Speed |
| | 1 | FC-HS | Energize Fan at High Speed |
| **30RAN022-030** | 1 | FC-A1 | First Stage Condenser Fan |
| | 2 | FC-A2 | Second Stage Condenser Fan |
| **30RAN032-040**   | 1 | FC-A1 | On with Compressor A1 and/or Compressor A2 |
| | 2 | FC-A2 | First Stage Condenser Fan, Circuit A |
| | 3 | FC-LS | Low Speed, Fan on w/Compressor B1 |
| | 3 | FC-HS | Energize Fan at High Speed, Circuit B |
| **30RAN042-055**   | 1 | FC-A1 | On with Compressor A1 and/or Compressor A2 |
| | 2 | FC-A2 | First Stage Condenser Fan, Circuit A |
| | 3 | FC-B1 | On with Compressor B1 and/or Compressor B2 |
| | 4 | FC-B2 | First Stage Condenser Fan, Circuit B |

**Fig. 14 — 30RA Condenser Fan Sequence**

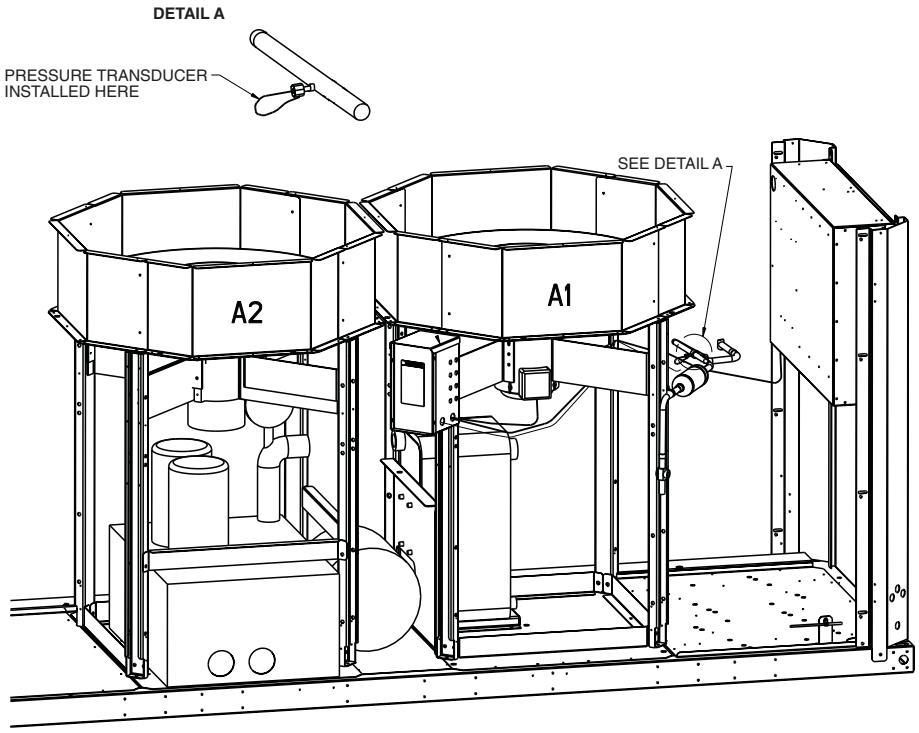



**Fig. 15 — Typical Motormaster® V Controller and Pressure Transducer Location (Sizes 022-030 Shown)**

**Operation of Machine Based on Control Method and Cooling Set Point Selection Settings —** Machine On/Off control is determined by the configuration of the control method (CTRL) [Configuration, OPT2] and cooling set point select (CLSP) [Configuration, SLCT] variables. All models are factory configured with cooling set point select set to 1 (single set point, CSP1). With the control method set to 0, simply switching the Enable/Off/Remote Contact switch to the Enable or Remote Contact position (external contacts closed) will put the chiller in an occupied state. The control mode [Operating Modes, MODE] will be 1 (OFF LOCAL) when the switch is Off and will be 5 (ON LOCAL) when in the Enable position or Remote Contact position with external contacts closed.

Two other control methods are available for Machine On/Off control:

OCCUPANCY SCHEDULE (CTRL=2) — The Main Base Board will use the operating schedules as defined under the Time Clock mode in the Marquee display. These schedules are identical. The schedule number must be set to 1 for local schedule.

The schedule number can be set anywhere from 65 to 99 for operation under a SCN global schedule. The Enable/Off/Remote Contact must be in the Enable or Remote Contact position. The control mode [Operating Modes, MODE] will be 1 when the switch is Off. The control mode will be 3 when the Enable/Off/Remote Contact switch input is On and the time of day is during an unoccupied period. Similarly, the control mode will be 7 when the time of day is during an occupied period.

SCN SCHEDULE (CTRL=3) — An external SCN device such as Flotronic™ System Manager controls the On/Off state of the machine. This SCN device forces the variable 'CHIL_S_S' between Start/Stop to control the chiller. The control mode [Operating Modes, MODE] will be 1 when the switch is Off. The control mode will be 2 when the Enable/Off/Remote Contact switch input is On and the CHIL_S_S variable is 'Stop.' Similarly, the control mode will be 6 when the CHIL_S_S variable is 'Start.'

Table 8 illustrates how the control method and cooling set point select variables direct the operation of the chiller and the set point to which it controls. The illustration also shows the ON/OFF state of the machine for the given combinations.

### Cooling Set Point Select

SINGLE — Unit operation is based on Cooling Set Point 1 (CSP1) [Set Point, COOL].

DUAL SWITCH — Unit operation is based on Cooling Set Point 1 (CSP1) [Set Point, COOL] when the Dual Set Point switch contacts are open and Cooling Set Point 2 (CSP2) [Set Point, COOL] when they are closed.

DUAL SCN OCCUPIED — Unit operation is based on Cooling Set Point 1 (CSP1) [Set Point, COOL] during the Occupied mode and Cooling Set Point 2 (CSP2) [Set Point, COOL] during the Unoccupied mode as configured under the local occupancy schedule accessible only from SCN. Schedule Number in Table SCHEDOVR (See Appendix A) must be configured to 1. If the Schedule Number is set to 0, the unit will operate in a continuous 24-hr Occupied mode. Control method must be configured to 0 (switch). See Table 8.

4 TO 20 mA INPUT — Unit operation is based on an external 4 to 20 mA signal input to the Energy Management Module (EMM).

LOW SOUND MODE OPERATION — All models are factory configured with the Low Sound Mode disabled. In the Configuration mode under sub-mode OPT2, items for low sound mode select (LS.MD), low sound start time (LS.ST), low sound end time (LS.ND) and low sound capacity limit (LS.LT) are factory configured so that the chiller always runs as quietly as possible. This results in operation at increased saturated condensing temperature. As a result, some models may not be able to achieve rated efficiency. For chiller operation at rated efficiency, disable the low sound mode or adjust the low sound mode start and stop times accordingly or set both times to 00:00 for rated efficiency operation 24 hours per day. In addition, the low sound capacity limit can be used to reduce overall chiller capacity, if required, by limiting the maximum to a user-configured percentage.

**Table 8 — Control Methods and Cooling Set Points**

| CONTROL TYPE (CTRL) | OCCUPANCY STATE | COOLING SET POINT SELECT (CLSP) | | | |
|---|---|---|---|---|---|
| | | 0 (single) | 1 (dual, switch) | 2 (dual, occ) | 3 (4 to 20 mA) |
| 0 (switch) | Occupied | ON,CSP1 | ON* | ON,CSP1 | ON† |
| | Unoccupied | ON,CSP1 | ON* | ON,CSP2 | ON |
| 2 (Occupancy) | Occupied | ON,CSP1 | ON* | Illegal | ON† |
| | Unoccupied | OFF | OFF | Illegal | OFF |
| 3 (SCN) | Occupied | ON,CSP1 | ON* | ON,CSP1 | ON† |
| | Unoccupied | ON,CSP1 | ON* | ON,CSP2 | ON† |

*Dual set point switch input used. CSP1 used when switch input is open. CSP2 used when switch input is closed.
†Cooling set point determined from 4 to 20 mA input to Energy Management Module (EMM) to terminals TB6-3,5.

HEATING OPERATION — The chiller can be used for pump outputs or optional factory-installed hydronic system operation can be utilized for heating applications. The heating mode is activated when the control sees a field-supplied closed switch input to terminal block TB5-7,8. The control locks out cooling when the heat relay input is seen. A field-supplied boiler relay connection is made using heat relay and alarm relay contacts. Factory-installed 'BOILER' connections exist in the control panel near TB5 for these applications. Alarms and alerts A189 through A202 are active during heating operation.

**Marquee Display Usage (See Fig. 16 and Tables 8-27) —** The Marquee display module provides the user interface to the *Comfort*Link™ control system. The display has up and down arrow keys, an ESCAPE key, and an ENTER key. These keys are used to navigate through the different levels of the display structure. See Table 9. Press the ESCAPE key until the display is blank to move through the top 11 mode levels indicated by LEDs on the left side of the display.

Pressing the ESCAPE and ENTER keys simultaneously will scroll a clear language text description across the display indicating the full meaning of each display acronym. Pressing the ESCAPE and ENTER keys when the display is blank (Mode LED level) will return the Marquee display to its default menu of rotating display items. In addition, the password will be disabled requiring that it be entered again before changes can be made to password protected items.

Clear language descriptions in English, Spanish, French, or Portuguese can be displayed when properly configuring the LANG Item in the Configuration Mode, under the Display (DISP) submode. See Table 17. Throughout this text, the location of items in the menu structure will be described in the following format:

Item Expansion (ITEM) [Mode Name, Sub-mode Name]

For example, using the language selection item:

Language Selection (LANG) [Configuration, DISP]

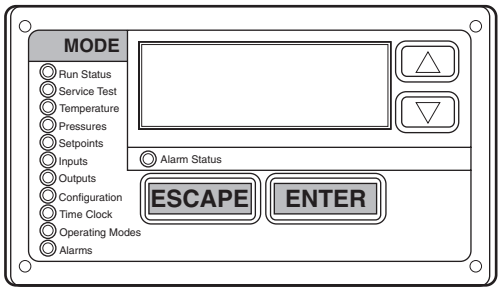



**Fig. 16 — Scrolling Marquee Display**

NOTE: When the LANG variable is changed to 1, 2, or 3, all appropriate display expansions will immediately change to the new language. No power-off or control reset is required when reconfiguring languages.

When a specific item is located, the display will flash showing the operator, the item, followed by the item value and then followed by the item units (if any). Press the ENTER key to stop the display at the item value. Items in the Configuration and Service Test modes are password protected. The display will flash PASS and WORD when required. Use the ENTER and arrow keys to enter the 4 digits of the password. The default password is 1111.

Changing item values or testing outputs is accomplished in the same manner. Locate and display the desired item. Press ENTER to stop the display at the item value. Press the ENTER key again so that the item value flashes. Use the arrow keys to change the value or state of an item and press the ENTER key to accept it. Press the ESCAPE key and the item, value, or units display will resume. Repeat the process as required for other items.

See Tables 8-27 for further details.

**Service Test (See Table 11) —** *Both main power and control circuit power must be on.*

The Service Test function should be used to verify proper operation of condenser fan(s), compressors, minimum load valve solenoid (if installed), cooler pump(s) and remote alarm relay. To use the Service Test mode, the Enable/Off/Remote Contact switch must be in the OFF position. Use the display keys and Table 11 to enter the mode and display TEST. Press ENTER twice so that OFF flashes. Enter the password if required. Use either arrow key to change the TEST value to the ON position and press ENTER. Press ESCAPE and the ▼ button to enter the OUTS or COMP sub-mode.

Test the condenser fans, cooler pump(s) and alarm relay by changing the item values from OFF to ON. These discrete outputs are then turned off if there is no keypad activity for 10 minutes. Test the compressor and minimum load valve solenoid (if installed) outputs in a similar manner. The minimum load valve solenoids will be turned off if there is no keypad activity for 10 minutes. Compressors will stay on until they are turned off by the operator. The Service Test mode will remain enabled for as long as there is one or more compressors running. All safeties are monitored during this test and will turn a compressor, circuit or the machine off if required. Any other mode or sub-mode can be accessed, viewed, or changed during the TEST mode. The STAT item [Run/Status, VIEW] will display "0" as long as the Service mode is enabled. The TEST sub-mode value must be changed back to OFF before the chiller can be switched to Enable or Remote contact for normal operation.

**Optional Factory-Installed Hydronic Package —** If the chiller has factory-installed chilled fluid pumps, specific steps should be followed for proper operation.

The pump(s) in the hydronic package come factory pre-wired into the main unit power supply/starter. In order to check proper pump rotation, use the Service Test function to test the condenser fans and observe them for proper rotation (counter clockwise when viewed from the top). If fans turn correctly, the pumps will rotate correctly. Clockwise rotation of the pump motor cooling fans can also be used to determine that pumps are rotating correctly.

**⚠ CAUTION**

Operation of pump in wrong direction, even for a few seconds, can cause irreversible damage to pump impeller and housing. Always verify correct wiring/pump rotation before operation.

Use Service Test function to test operation of pumps. Verify that the flow switch input is made when the pump is running. For dual pump hydronic systems, the control only uses one pump at a time. Consult the Installation Instructions supplied with this chiller and use the circuit setter balancing valve installed in hydronic package to adjust fluid flow rate.

**Cooler Pump Control —** The 30RA AquaSnap® machines equipped with a factory installed pump package are configured with the Cooler Pump Control (CPC) [Configuration, OPT1] ON.

Machines not equipped with a pump package are configured with the cooler pump control OFF. It is recommended that the machine control the chilled water pump. If not, a 5-minute time delay is required after the command to shut the machine down is sent before the chilled water pump is turned off. This is required to maintain water flow during the shutdown period of the machine.

With or without this option enabled, the cooler pump relay will be energized when the machine enters an ON status (i.e., On Local, On SCN, On Time). An A207 - Cooler Freeze Protection Alarm, will energize the cooler pump relay also, as an override. The cooler pump relay will remain energized if the machine is in MODE 10 – Minimum Off Time.

**Cooler Pump Sequence of Operation —** At anytime the unit is in an ON status, as defined by the one of the following conditions, the cooler pump relay will be enabled.

1. The Enable-Off-Remote Switch in ENABLE, (CTRL=0).
2. Enable-Off-Remote Switch in REMOTE with a Start-Stop remote contact closure, (CTRL=0).
3. An Occupied Time Period from an Occupancy Schedule in combination with items 1 or 2, (CTRL=2).
4. A SCN Start-Stop Command to Start in combination with items 1 or 2, (CTRL=3).

As stated before, there are certain alarm conditions and Operating Modes that will turn the cooler pump relay ON. This sequence will describe the normal operation of the pump control algorithm.

When the unit cycles from an “On” state to an “Off” state, the cooler pump output will remain energized for the Cooler Pump Shutdown Delay (PM.DY) [Configuration, OPT1]. This is configurable from 0 to 10 minutes. The factory default is 1 minute. If the pump output was deenergized during the transition period, the pump output will not be energized.

NO INTEGRAL PUMP — SINGLE EXTERNAL PUMP CONTROL — With a single external pump, the following options must be configured:

- Cooler Pump Control (CPC) [Configuration, OPT1] OFF.
- Cooler Pump 1 Enable (PM1E) [Configuration, UNIT] NO.
- Cooler Pump 2 Enable (PM2E) [Configuration, UNIT] NO.

The maximum load allowed for the Chilled Water Pump Starter is 5 VA sealed, 10 VA inrush at 24 volts. The starter coil is powered from the chiller control system. The starter should be wired between TB5-11 and TB5-13. If equipped, the field-installed chilled water pump starter auxiliary contacts should be connected in series with the chilled water flow switch.

The Cooler Pump Relay will be energized when the machine is “On.” The chilled water pump interlock circuit consists of a chilled water flow switch and a field-installed chilled water pump interlock. If the chilled water pump interlock circuit does not close within five (5) minutes of starting, an A200 — Cooler Flow/Interlock failed to close at Start-Up alarm will be generated and chiller will not be allowed to start.

If the chilled water pump interlock or chilled water flow switch opens for at least three (3) seconds after initially being closed, an A201 — Cooler Flow/Interlock Contacts Opened During Normal Operation Alarm will be generated and the machine will stop.

NO INTEGRAL PUMP — DUAL EXTERNAL PUMP CONTROL — With two external pumps, the following options must be configured:

- Cooler Pump Control (CPC) [Configuration, OPT1] ON.
- Cooler Pump 1 Enable (PM1E) [Configuration, UNIT] YES.
- Cooler Pump 2 Enable (PM2E) [Configuration, UNIT] YES.

The maximum load allowed for the Chilled Water Pump Starters is 5 VA sealed, 10 VA inrush at 24 volts. The starter coil is powered from the chiller control system. The starter for Chilled Water Pump 1 should be wired between TB5-11 and TB5-13. The starter for Chilled Water Pump 2 should be wired between TB5-15 and TB5-13. A field-installed chilled water pump interlock for each pump must be connected to each pump’s interlock points on the Main Base Board. The Chilled Water Pump 1 Interlock, CWP1, must be connected to MBB-J7-1 and –2. The Chilled Water Pump 2 Interlock, CWP2, must be connected to MBB-J7-3 and –4. The chilled water pump interlock contacts should be rated for dry circuit application capable of handling 5 vdc at 2 mA.

SINGLE INTEGRAL PUMP CONTROL — With a single pump, the following options must be configured:

- Cooler Pump Control (CPC) [Configuration, OPT1] ON.
- Cooler Pump 1 Enable (PM1E) [Configuration, UNIT] YES.
- Cooler Pump 2 Enable (PM2E) [Configuration, UNIT] NO.

With a single integral pump, the Cooler Pump Starter will be energized when the machine is occupied. As part of the factory-installed package, an auxiliary set of contacts is wired to the MBB to serve as Chilled Water Pump Interlock. When the mechanical cooling is called for, the pump interlock and flow switch is checked. If the circuits are closed, the machine starts its capacity routine. If the auxiliary contact interlock does not close within 25 seconds of the ON command, a T190 — Cooler Pump 1 Aux Contacts Failed to Close at Start-Up Alert will be generated and the pump shut down. The unit will not be allowed to start. If the chilled water flow switch does not close within one (1) minute, two alarms will be generated. A T192 — Cooler Pump 1 Failed to Provide Flow at Start-Up Alert and an A200 – Cooler Flow/Interlock failed to close at Start-Up will be generated and chiller will not be allowed to start.

If the chilled water flow switch opens for at least 3 seconds after initially being closed, a T196 — Flow Lost While Pump 1 Running Alert and an A201 — Cooler Flow/Interlock Contacts

Opened During Normal Operation Alarm will be generated and the machine will stop.

If the control detects the chilled water pump interlock open for 25 seconds after initially being closed, a T194 — Cooler Pump 1 Contacts Opened During Normal Operation Alert is generated and the unit is shut down.

If the control detects the chilled water flow switch circuit closed for at least 5 minutes with the pump output OFF, an A202 — Cooler Pump Interlock Closed When Pump is Off Alarm will be generated and the unit will not be allowed to start.

If the control detects that the chilled water pump auxiliary contacts are closed for at least 25 seconds while the pump is OFF, a T198 — Cooler Pump 1 Aux Contacts Closed While Pump Off Alert is generated. The chiller will not be allowed to start.

If the control starts a pump and the wrong interlock circuit closes for at least 20 seconds, an A189 — Cooler Pump and Aux Contact Input Miswire Alarm will be generated. The unit will be prevented from starting.

As part of a pump maintenance routine, the pump can be started to maintain lubrication of the pump seal. To utilize this function, Cooler Pmp Periodic Start (PM.P.S) [Configuration, UNIT] must be set to YES. This option is set to NO as the factory default. With this feature enabled, if the pump is not operating, it will be started and operated for 2 seconds starting at 14:00 hours. If the pump is operating, this routine is skipped. If the pump has failed and an Alarm/Alert condition is active, the pump will not start that day.

DUAL INTEGRAL PUMP CONTROL — With a dual integral pump package, the following options must be configured:

- Cooler Pump Control (CPC) [Configuration, OPT1] ON.
- Cooler Pump 1 Enable (PM1E) [Configuration, UNIT] YES
- Cooler Pump 2 Enable (PM2E) [Configuration, UNIT] YES

Pump Start Selection is a field-configurable choice. Cooler Pump Select (PM.SL) [Configuration, UNIT] is factory defaulted to 0 (Automatic). This value can be changed to 1 (Pump 1 Starts First) or 2 (Pump 2 Starts First). If PM.SL is 0 (Automatic), the pump selection is based on two criteria: the alert status of a pump and the operational hours on the pump. If a pump has an active Alert condition, it will not be considered for the lead pump. The pump with the lowest operational hours will be the lead pump. A pump is selected by the control to start and continues to be the lead pump until the Pump Changeover Hours (PM.DT) [Configuration, UNIT] is reached. The Lead Pump (LD.PM) [Run Status, VIEW] indicates the pump that has been selected as the lead pump: 1 (Pump 1), 2 (Pump 2), 3 (No Pump). The Pump Changeover Hours is factory defaulted to 500 hours. Regardless of the Cooler Pump Selection, any pump that has an active alert will not be allowed to start.

With the dual integral pump package, the Cooler Pump Starter will be energized when the machine is in an occupied period. As part of the factory-installed package, an auxiliary set of contacts is wired to the MBB to serve as Chilled Water Pump Interlock, one set for each pump to individual channels on the MBB. With a call for mechanical cooling, the specific pump interlock and flow switch are checked. If the circuits are closed, the machine starts its capacity routine. If Pump 1 starts and the auxiliary contact interlock does not close within 25 seconds of the ON command, a T190 – Cooler Pump 1 Aux Contacts Failed to Close at Start-Up Alert will be generated and the pump shut down. The unit will not be allowed to start. If the chilled water flow switch does not close within 1 minute, two alarms will be generated. A T192 – Cooler Pump 1 Failed to Provide Flow at Start-Up Alert and an A200 – Cooler Flow/Interlock failed to close at Start-Up will be generated and chiller will not be allowed to start. In either fault case listed above, Pump 2 will be commanded to start once Pump 1 has failed.

If Pump 2 starts and the auxiliary contact interlock does not close within 25 seconds of the ON command, a T191 — Cooler Pump 2 Aux Contacts Failed to Close at Start-Up Alert will be generated and the pump shut down. The unit will not be allowed to start. If the chilled water flow switch does not close within one (1) minute, two alarms will be generated. A T193 — Cooler Pump 2 Failed to Provide Flow at Start-Up Alert and an A200 – Cooler Flow/Interlock failed to close at Start-Up will be generated and chiller will not be allowed to start. In either fault case listed above, Pump 1 will be commanded to start once Pump 2 has failed.

If the chilled water flow switch opens for at least 3 seconds after initially being closed, a T196 — Flow Lost While Pump 1 Running Alert or T197 — Flow Lost While Pump 2 Running Alert for the appropriate pump and an A201 — Cooler Flow/Interlock Contacts Opened During Normal Operation Alarm will be generated and the machine will stop. If available, the other pump will be started. If flow is proven, the machine will be allowed to restart.

If the chilled water pump interlock opens for 25 seconds after initially being closed is detected by the control, the appropriate T194 – Cooler Pump 1 Contacts Opened During Normal Operation Alert or T195 – Cooler Pump 2 Contacts Opened During Normal Operation Alert is generated and the unit is shut down. If available, the other pump will be started. If flow is proven, the machine will be allowed to restart.

If the control detects that the chilled water flow switch circuit is closed for at least 5 minutes with the pump output OFF, an A202 – Cooler Pump Interlock Closed When Pump is Off Alarm will be generated and the unit will not be allowed to start.

If the control detects that the chilled water pump auxiliary contacts are closed for at least 25 seconds while the pump is OFF, the appropriate T198 – Cooler Pump 1 Aux Contacts Closed While Pump Off or Alert T199 – Cooler Pump 2 Aux Contacts Closed While Pump Off Alert is generated. The chiller will not be allowed to start.

If the control starts a pump and the wrong interlock circuit closes for at least 20 seconds, an A189 – Cooler Pump and Aux Contact Input Miswire Alarm will be generated. The unit will be prevented from starting.

The control will allow for pump changeover. Two methods will change the pump sequence. Before the changeover can occur, the unit must be at Capacity Stage 0. During changeover the chilled water flow switch input is ignored for 10 seconds to avoid a nuisance alarm.

With Cooler Pump Select (PM.SL) [Configuration, UNIT] set to 0 (Automatic) and when the differential time limit Pump Changeover Hours (PM.DT) [Configuration, UNIT] is reached, the lead pump will be turned OFF. Approximately one (1) second later, the lag pump will start. Manual changeover can be accomplished by changing Rotate Cooler Pump Now (ROT.P) [Configuration, UNIT] to YES only if the machine is at Capacity Stage 0 and the differential time limit Pump Changeover Hours (PM.DT) [Configuration, UNIT] is reached. If the PM.DT is not satisfied, the changeover will not occur. With the machine at Capacity Stage 0, the pumps would rotate automatically as part of the normal routine.

With Cooler Pump Select (PM.SL) [Configuration, UNIT] set to 1 (Pump 1 Starts First) or 2 (Pump 2 Starts First), a manual changeover can be accomplished by changing PM.SL only. The machine Remote-Off-Enable Switch must be in the OFF position to change this variable. The Rotate Cooler Pump Now (ROT.P) [Configuration, UNIT] feature does not work for these configuration options.

As part of a pump maintenance routine, the pumps can be started to maintain lubrication to the pump seal. To utilize this function, Cooler Pmp Periodic Start (PM.P.S) [Configuration, UNIT] must be set to YES. This option is set to NO as the factory default. If feature is enabled and the pump(s) are not operating, then the pumps will be operated every other day for 2 seconds starting at 14:00 hours. If a pump has failed and has an active Alert condition, it will not be started that day.

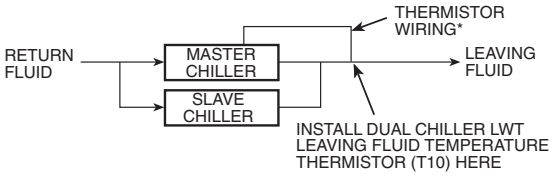
**Configuring and Operating Dual Chiller Control —** The dual chiller routine is available for the control of two units supplying chilled fluid on a common loop. This control algorithm is designed for parallel fluid flow arrangement only. One chiller must be configured as the master chiller, the other as the slave. An additional leaving fluid temperature thermistor (Dual Chiller LWT) must be installed as shown in Fig. 17 and connected to the master chiller. Refer to Sensors section, page 4, for wiring. The SCN communication bus must be connected between the two chillers. Connections can be made to the SCN screw terminals on TB3. Refer to Sterlco Comfort Network Interface section, page 3, for wiring information.

Refer to Table 21 for dual chiller configuration. In this example the master chiller will be configured at address 1 and the slave chiller at address 2. The master and slave chillers must reside on the same SCN bus (SCNB) but cannot have the same SCN address (SCNA) [Configuration, OPT2]. Both master and slave chillers must have Lead/Lag Chiller Enable (LLEN) [Configuration, RSET] configured to ENBL. Master/Slave Select (MSSL) [Configuration, RSET] must be configured to MAST for the master chiller and SLVE for the slave. Also in this example, the master chiller will be configured to use Lead/Lag Balance Select (LLBL) and Lead/Lag Balance Delta (LLBD) [Configuration, RSET] to even out the chiller run-times weekly. The Lag Start Delay (LLDY) [Configuration, RSET] feature will be set to 10 minutes. This will prevent the lag chiller from starting until the lead chiller has been at 100% capacity for the length of the delay time. Parallel configuration (PARA) [Configuration, RSET] can only be configured to YES. The variables LLBL, LLBD and LLDY are not used by the slave chiller.

Dual chiller start/stop control is determined by configuration of Control Method (CTRL) [Configuration, OPT2] of the Master chiller. The Slave chiller should always be configured for CTRL=0, *Switch*. If the chillers are to be controlled by Remote Contacts, both Master and Slave chillers should be enabled together. Two separate relays or one relay with two sets of contacts may control the chillers. The Enable/Off/Remote Contact switch should be in the Remote Contact position on both the Master and Slave chillers. The Enable/Off/Remote Contact switch should be in the Enable position for CTRL=2, *Occupancy* or CTRL=3, S*CN Control*.

Both chillers will stop if the Master chiller Enable/Off/Remote Contact switch is in the Off position. If the Emergency Stop switch is turned off or an alarm is generated on the Master chiller the Slave chiller will operate in a Stand-Alone mode. If the Emergency Stop switch is turned off or an alarm is generated on the Slave chiller the Master chiller will operate in a Stand-Alone mode.

The master chiller controls the slave chiller by changing its Control Mode (STAT) [Run Status, VIEW] and its operating setpoint or Control Point (CTPT) [Run Status, VIEW].




*Depending on piping sizes, use either:
- HH79NZ014 sensor/10HB50106801 well (3-in. sensor/well)
- HH79NZ029 sensor/10HB50106802 well (4-in. sensor/well)

**Fig. 17 — Dual Chiller Thermistor Location**

**Table 9 — Marquee Display Menu Structure***

| MODE | RUN STATUS | SERVICE TEST | TEMPERATURES | PRESSURES | SET POINTS | INPUTS | OUTPUTS | CONFIGURATION | TIME CLOCK | OPERATING MODES | ALARMS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SUB-MODE | Auto Display (VIEW) | Manual Mode On/Off (TEST) | Unit Temperatures (UNIT) | Ckt A Pressures (PRC.A) | Cooling (COOL) | Unit Discrete (GEN.I) | Unit Discrete (GEN.O) | Display (DISP) | Unit Time (TIME) | Modes (MODE) | Current (CRNT) |
| | Machine Hours/Starts (RUN) | Unit Outputs (OUTS) | Ckt A Temperatures (CIR.A) | Ckt B Pressures (PRC.B) | Head Pressure (HEAD) | Ckt A/B (CRCT) | Ckt A (CIR.A) | Machine (UNIT) | Unit Date (DATE) | | Reset Alarms (RCRN) |
| | Compressor Run Hours (HOUR) | Ckt A Comp Tests (CMPA) | Ckt B Temperatures (CIR.B) | | Brine Freeze-point (FRZ) | Unit Analog (4-20) | Ckt B (CIR.B) | Options 1 (OPT1) | Daylight Saving Time (DST) | | Alarm History (HIST) |
| | Compressor Starts (STRT) | Ckt B Comp Tests (CMPB) | | | | | | Options 2 (OPT2) | Schedule Number (SCH.N) | | |
| | Pump Maint. (PM) | | | | | | | Temperature Reset (RSET) | Local Schedule (SCH.L) | | |
| | Software Version (VERS) | | | | | | | Set Point Select (SLCT) | Schedule Override (OVR) | | |
| | | | | | | | | Service Configuration (SERV) | | | |
| | | | | | | | | Broadcast Configuration (BCST) | | | |

LEGEND

**Ckt —** Circuit

*Throughout this text, the location of items in the menu structure will be described in the following format:

Item Expansion (ITEM) [Mode Name, Sub-mode Name]

For example, using the language selection item:

Language Selection (LANG) [Configuration, DISP]

## Table 10 — Run Status Mode and Sub-Mode Directory

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | SUB-ITEM | DISPLAY | SUB-ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|---|---|---|---|
| **VIEW** | ENTER | EWT | XXX.X °F | | | | | ENTERING FLUID TEMP | |
| | ↓ | LWT | XXX.X °F | | | | | LEAVING FLUID TEMP | |
| | ↓ | SETP | XXX.X °F | | | | | ACTIVE SETPOINT | |
| | ↓ | CTPT | XXX.X °F | | | | | CONTROL POINT | |
| | ↓ | LOD.F | XXX | | | | | LOAD/UNLOAD FACTOR | |
| | ↓ | STAT | X | | | | | CONTROL MODE | 0 = Service Test<br>1 = Off Local<br>2 = Off SCN<br>3 = Off Time<br>4 = Off Emrgcy<br>5 = On Local<br>6 = On SCN<br>7 = On Time<br>8 = Ht Enabled<br>9 = Pump Delay |
| | ↓ | LD.PM | | | | | | LEAD PUMP | |
| | ↓ | OCC | YES/NO | | | | | OCCUPIED | |
| | ↓ | LS.AC | YES/NO | | | | | LOW SOUND ACTIVE | |
| | ↓ | MODE | YES/NO | | | | | OVERRIDE MODES IN EFFECT | |
| | ↓ | CAP | XXX % | | | | | PERCENT TOTAL CAPACITY | |
| | ↓ | STGE | X | | | | | REQUESTED STAGE | |
| | ↓ | ALRM | XXX | | | | | CURRENT ALARMS & ALERTS | |
| | ↓ | TIME | XX.XX | | | | | TIME OF DAY | 00.00-23.59 |
| | ↓ | MNTH | XX | | | | | MONTH OF YEAR | 1 = January, 2 = February, etc. |
| | ↓ | DATE | XX | | | | | DAY OF MONTH | 01-31 |
| | ↓ | YEAR | XX | | | | | YEAR OF THE CENTURY | |
| **RUN** | ENTER | HRS.U | XXXX HRS | | | | | MACHINE OPERATING HOURS | |
| | ↓ | STR.U | XXXX | | | | | MACHINE STARTS | |
| | ↓ | HR.P1 | XXXX.X | | | | | PUMP 1 RUN HOURS | |
| | ↓ | HR.P2 | XXXX.X | | | | | PUMP 2 RUN HOURS | |
| **HOUR** | ENTER | HRS.A | XXXX HRS | | | | | CIRCUIT A RUN HOURS | |
| | ↓ | HRS.B | XXXX HRS | | | | | CIRCUIT B RUN HOURS | See Note |
| | ↓ | HR.A1 | XXXX HRS | | | | | COMPRESSOR A1 RUN HOURS | |
| | ↓ | HR.A2 | XXXX HRS | | | | | COMPRESSOR A2 RUN HOURS | |
| | ↓ | HR.B1 | XXXX HRS | | | | | COMPRESSOR B1 RUN HOURS | See Note |
| | ↓ | HR.B2 | XXXX HRS | | | | | COMPRESSOR B2 RUN HOURS | See Note |
| **STRT** | ENTER | ST.A1 | XXXX | | | | | COMPRESSOR A1 STARTS | |
| | ↓ | ST.A2 | XXXX | | | | | COMPRESSOR A2 STARTS | |
| | ↓ | ST.B1 | XXXX | | | | | COMPRESSOR B1 STARTS | See Note |
| | ↓ | ST.B2 | XXXX | | | | | COMPRESSOR B2 STARTS | See Note |
| **PM** | ENTER | PUMP | | | | | | PUMP MAINTENANCE | |
| | ENTER | | | SI.PM | XXXX HRS | | | PUMP SERVICE INTERVAL | |
| | ↓ | | | P.1.DN | XXXX HRS | | | PUMP 1 SERVICE COUNTDOWN | |
| | ↓ | | | P.2.DN | XXXX HRS | | | PUMP 2 SERVICE COUNTDOWN | |
| | ↓ | | | P.1.MN | YES/NO | | | PUMP 1 MAINTENANCE DONE | User Entry |
| | ↓ | | | P.2.MN | YES/NO | | | PUMP 2 MAINTENANCE DONE | User Entry |

NOTE: If the unit has a single circuit, the Circuit B items will not appear in the display, except the ability to configure circuit B will be displayed.

## Table 10 — Run Status Mode and Sub-Mode Directory (cont)

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | SUB-ITEM | DISPLAY | SUB-ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|---|---|---|---|
| **PM (cont)** | ↓ | | | PMDT | | | | PUMP MAINTENANCE DATES | |
| | ENTER | | | | | P.1.M0 | | MM/DD/YY HH:MM | |
| | ↓ | | | | | P.1.M1 | | MM/DD/YY HH:MM | |
| | ↓ | | | | | P.1.M2 | | MM/DD/YY HH:MM | |
| | ↓ | | | | | P.1.M3 | | MM/DD/YY HH:MM | |
| | ↓ | | | | | P.1.M4 | | MM/DD/YY HH:MM | |
| | ↓ | | | | | P.2.M0 | | MM/DD/YY HH:MM | |
| | ↓ | | | | | P.2.M1 | | MM/DD/YY HH:MM | |
| | ↓ | | | | | P.2.M2 | | MM/DD/YY HH:MM | |
| | ↓ | | | | | P.2.M3 | | MM/DD/YY HH:MM | |
| | ↓ | | | | | P.2.M4 | | MM/DD/YY HH:MM | |
| | ENTER | STRN | | | | | | STRAINER MAINTENANCE | |
| | ENTER | | | SI.ST | XXXX HRS | | | STRAINER SRVC INTERVAL | |
| | ↓ | | | S.T.DN | XXXX HRS | | | STRAINER SRVC COUNTDOWN | |
| | ↓ | | | S.T.MN | YES/NO | | | STRAINER MAINT. DONE | User Entry |
| | ↓ | | | ST.DT | | | | STRAINER MAINT. DATES | |
| | ENTER | | | | | S.T.M0 | | MM/DD/YY HH:MM | |
| | ↓ | | | | | S.T.M1 | | MM/DD/YY HH:MM | |
| | ↓ | | | | | S.T.M2 | | MM/DD/YY HH:MM | |
| | ↓ | | | | | S.T.M3 | | MM/DD/YY HH:MM | |
| | ↓ | | | | | S.T.M4 | | MM/DD/YY HH:MM | |
| | ENTER | COIL | | | | | | COIL MAINTENANCE | |
| | ENTER | | | SI.CL | XXXX HRS | | | COIL SRVC INTER | |
| | ↓ | | | C.L.DN | XXXX HRS | | | COIL SERVICE COUNTDOWN | |
| | ↓ | | | C.L.MN | YES/NO | | | COIL MAINT. DONE | User Entry |
| | ↓ | | | CL.DT | | | | COIL MAINTENANCE DATES | |
| | ENTER | | | | | C.L.M0 | | MM/DD/YY HH:MM | |
| | ↓ | | | | | C.L.M1 | | MM/DD/YY HH:MM | |
| | ↓ | | | | | C.L.M2 | | MM/DD/YY HH:MM | |
| | ↓ | | | | | C.L.M3 | | MM/DD/YY HH:MM | |
| | ↓ | | | | | C.L.M4 | | MM/DD/YY HH:MM | |
| **VERS** | ENTER | MBB | | | | | | CESR-131279-xx-xx | xx-xx is Version number* |
| | ↓ | MARQ | | | | | | CESR-131171-xx-xx | xx-xx is Version number* |
| | ↓ | EMM | | | | | | CESR-131174-xx-xx | xx-xx is Version number* |
| | ↓ | NAVI | | | | | | CESR-131227-xx-xx | xx-xx is Version number* |

*Press ENTER and ESCAPE simultaneously to obtain version number.

## Table 11 — Service Test Mode and Sub-Mode Directory

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|
| **TEST** | ENTER | | ON/OFF | SERVICE TEST MODE | To Enable Service Test Mode, move Enable/Off/Remote Contact switch to OFF. Change TEST to ON. Move switch to ENABLE. |
| **OUTS** | | | | OUTPUTS AND PUMPS | |
| | ENTER | FAN1 | ON/OFF | FAN 1 RELAY | |
| | ↓ | FAN2 | ON/OFF | FAN 2 RELAY | |
| | ↓ | CLP.1 | ON/OFF | COOLER PUMP 1 RELAY | |
| | ↓ | CLP.2 | ON/OFF | COOLER PUMP 2 RELAY | |
| | ↓ | CL.HT | ON/OFF | COOLER/PUMP HEATER | |
| | ↓ | RMT.A | ON/OFF | REMOTE ALARM RELAY | |
| **CMPA** | | | | CIRCUIT A COMPRESSOR TEST | |
| | ENTER | CC.A1 | ON/OFF | COMPRESSOR A1 RELAY | |
| | ↓ | CC.A2 | ON/OFF | COMPRESSOR A2 RELAY | |
| | ↓ | MLV | ON/OFF | MINIMUM LOAD VALVE RELAY | |
| **CMPB** | | | | CIRCUIT B COMPRESSOR TEST | See Note |
| | ENTER | CC.B1 | ON/OFF | COMPRESSOR B1 RELAY | |
| | ↓ | CC.B2 | ON/OFF | COMPRESSOR B2 RELAY | |
| | ↓ | MLV | ON/OFF | MINIMUM LOAD VALVE RELAY | |

NOTE: If the unit has a single circuit, the Circuit B items will not appear in the display, except the ability to configure circuit B will be displayed.

## Table 12 — Temperature Mode and Sub-Mode Directory

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|
| **UNIT** | | | | ENT AND LEAVE UNIT TEMPS | |
| | ENTER | CEWT | XXX.X °F | COOLER ENTERING FLUID | |
| | ↓ | CLWT | XXX.X °F | COOLER LEAVING FLUID | |
| | ↓ | OAT | XXX.X °F | OUTSIDE AIR TEMPERATURE | |
| | ↓ | SPT | XXX.X °F | SPACE TEMPERATURE | |
| | ↓ | DLWT | XXX.X °F | LEAD/LAG LEAVING FLUID | |
| **CIR.A** | | | | TEMPERATURES CIRCUIT A | |
| | ENTER | SCT.A | XXX.X °F | SATURATED CONDENSING TMP | |
| | ↓ | SST.A | XXX.X °F | SATURATED SUCTION TEMP | |
| | ↓ | RGT.A | XXX.X °F | COMPR RETURN GAS TEMP | |
| | ↓ | SH.A | XXX.X ^F | SUCTION SUPERHEAT TEMP | |
| **CIR.B** | | | | TEMPERATURES CIRCUIT B | See Note |
| | ENTER | SCT.B | XXX.X °F | SATURATED CONDENSING TMP | See Note |
| | ↓ | SST.B | XXX.X °F | SATURATED SUCTION TEMP | See Note |
| | ↓ | RGT.B | XXX.X °F | COMPR RETURN GAS TEMP | See Note |
| | ↓ | SH.B | XXX.X ^F | SUCTION SUPERHEAT TEMP | See Note |

NOTE: If the unit has a single circuit, the Circuit B items will not appear in the display, except the ability to configure circuit B will be displayed.

## Table 13 — Pressure Mode and Sub-Mode Directory

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|
| PRC.A | | | | PRESSURES CIRCUIT A | |
| | ENTER | DP.A | XXX.X PSIG | DISCHARGE PRESSURE | |
| | ↓ | SP.A | XXX.X PSIG | SUCTION PRESSURE | |
| PRC.B | | | | PRESSURES CIRCUIT B | See Note |
| | ENTER | DP.B | XXX.X PSIG | DISCHARGE PRESSURE | See Note |
| | ↓ | SP.B | XXX.X PSIG | SUCTION PRESSURE | See Note |

NOTE: If the unit has a single circuit, the Circuit B items will not appear in the display, except the ability to configure circuit B will be displayed.

## Table 14 — Set Point and Sub-Mode Directory

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|
| COOL | | | | COOLING SETPOINTS | |
| | ENTER | CSP.1 | XXX.X °F | COOLING SETPOINT 1 | Default: 44 F |
| | ↓ | CSP.2 | XXX.X °F | COOLING SETPOINT 2 | Default: 44 F |
| | ↓ | CSP.3 | XXX.X °F | ICE SETPOINT | Default: 32 F |
| HEAD | | | | HEAD PRESSURE SETPOINTS | |
| | ENTER | HD.P.A | XXX.X °F | CALCULATED HP SETPOINT A | Default: 113 F (Read Only) |
| | ↓ | HD.P.B | XXX.X °F | CALCULATED HP SETPOINT B | Default: 113 F (Read Only) |
| FRZ | | | | BRINE FREEZE SETPOINT | |
| | ENTER | BR.FZ | XXX.X °F | BRINE FREEZE POINT | Default: 34 F |

## Table 15 — Inputs Mode and Sub-Mode Directory

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|
| GEN.I | | | | GENERAL INPUTS | |
| | ENTER | STST | STRT/STOP | START/STOP SWITCH | |
| | ↓ | FLOW | ON/OFF | COOLER FLOW SWITCH | |
| | ↓ | PM.F.1 | OPEN/CLSE | COOLER PUMP 1 INTERLOCK | |
| | ↓ | LD.PM | X | Lead Pump | 1 = Pump 1<br>2 = Pump 2<br>3 = No Pump |
| | ↓ | PM.F.2 | OPEN/CLSE | COOLER PUMP 2 INTERLOCK | |
| | ↓ | HT.RQ | ON/OFF | HEAT REQUEST | |
| | ↓ | DLS1 | ON/OFF | DEMAND LIMIT SWITCH 1 | |
| | ↓ | DLS2 | ON/OFF | DEMAND LIMIT SWITCH 2 | |
| | ↓ | ICED | ON/OFF | ICE DONE | |
| | ↓ | DUAL | ON/OFF | DUAL SETPOINT SWITCH | |
| CRCT | | | | CIRCUITS INPUTS | |
| | ENTER | FKA1 | ON/OFF | COMPRESSOR A1 FEEDBACK | |
| | ↓ | FKA2 | ON/OFF | COMPRESSOR A2 FEEDBACK | |
| | ↓ | FKB1 | ON/OFF | COMPRESSOR B1 FEEDBACK | See Note |
| | ↓ | FKB2 | ON/OFF | COMPRESSOR B2 FEEDBACK | See Note |
| 4-20 | | | | 4-20 MA INPUTS | |
| | ENTER | DMND | XX.X MA | 4-20 MA DEMAND SIGNAL | |
| | ↓ | RSET | XX.X MA | 4-20 MA RESET SIGNAL | |
| | ↓ | CSP | XX.X MA | 4-20 MA COOLING SETPOINT | |

## Table 16 — Outputs Mode and Sub-Mode Directory

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|
| GEN.O | | | | GENERAL OUTPUTS | |
| | ENTER | FAN1 | ON/OFF | FAN 1 RELAY | |
| | ↓ | FAN2 | ON/OFF | FAN 2 RELAY | |
| | ↓ | C.WP1 | ON/OFF | COOLER PUMP RELAY 1 | |
| | ↓ | C.WP2 | ON/OFF | COOLER PUMP RELAY 2 | |
| | ↓ | CLHT | ON/OFF | COOLER/PUMP HEATER | |
| | ↓ | MLV.R | ON/OFF | MINIMUM LOAD VALVE RELAY | |
| CIR.A | | | | OUTPUTS CIRCUIT A | |
| | ENTER | CC.A1 | ON/OFF | COMPRESSOR A1 RELAY | |
| | ↓ | CC.A2 | ON/OFF | COMPRESSOR A2 RELAY | |
| CIR.B | | | | OUTPUTS CIRCUIT B | See Note |
| | ENTER | CC.B1 | ON/OFF | COMPRESSOR B1 RELAY | |
| | ↓ | CC.B2 | ON/OFF | COMPRESSOR B2 RELAY | |

NOTE: If the unit has a single circuit, the Circuit B items will not appear in the display, except the ability to configure circuit B will be displayed.

## Table 17 — Configuration Mode and Sub-Mode Directory

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT | | |
|---|---|---|---|---|---|---|---|
| DISP | | | | DISPLAY CONFIGURATION | | | |
| | ENTER | TEST | ON/OFF | TEST DISPLAY LEDS | | | |
| | ↓ | METR | ON/OFF | METRIC DISPLAY | Off = English; On = Metric | | |
| | ↓ | LANG | X | LANGUAGE SELECTION | Default: 0<br>0 = English<br>1 = Espanol<br>2 = Francais<br>3 = Portuguese | | |
| | ↓ | PAS.E | ENBL/DSBL | PASSWORD ENABLE | | | |
| | ↓ | PASS | xxxx | SERVICE PASSWORD | | | |
| UNIT | ENTER | | | UNIT CONFIGURATION | | | |
| | ↓ | SZA.1 | XX | COMPRESSOR A1 SIZE | **Unit Size** | **60 Hz** | **50 Hz** |
| | | | | | 010 | 10 | 11 |
| | | | | | 015 | 15 | 7 |
| | | | | | 018 | 9 | 9 |
| | | | | | 022 | 9 | 11 |
| | | | | | 025 | 13 | 13 |
| | | | | | 030 | 15 | — |
| | | | | | 032 | — | 8 |
| | | | | | 035 | 9 | 13 |
| | | | | | 040 | 13 | — |
| | | | | | 042 | — | 11 |
| | | | | | 045 | 10 | 13 |
| | | | | | 050 | 13 | — |
| | | | | | 055 | 15 | — |
| | ↓ | SZA.2 | XX | COMPRESSOR A2 SIZE | **Unit Size** | **60 Hz** | **50 Hz** |
| | | | | | 015 | — | 7 |
| | | | | | 018 | 9 | 9 |
| | | | | | 022 | 13 | 11 |
| | | | | | 025 | 13 | 13 |
| | | | | | 030 | 15 | — |
| | | | | | 032 | — | 11 |
| | | | | | 035 | 13 | 13 |
| | | | | | 040 | 13 | — |
| | | | | | 042 | — | 11 |
| | | | | | 045 | 13 | 13 |
| | | | | | 050 | 13 | — |
| | | | | | 055 | 15 | — |
| | ↓ | SZB.1 | XX | COMPRESSOR B1 SIZE | **Unit Size** | **60 Hz** | **50 Hz** |
| | | | | | 032 | — | 13 |
| | | | | | 035 | 15 | 13 |
| | | | | | 040 | 15 | — |
| | | | | | 042 | — | 11 |
| | | | | | 045 | 10 | 13 |
| | | | | | 050 | 13 | — |
| | | | | | 055 | 15 | — |
| | ↓ | SZB.2 | XX | COMPRESSOR B2 SIZE | **Unit Size** | **60 Hz** | **50 Hz** |
| | | | | | 042 | — | 11 |
| | | | | | 045 | 13 | 13 |
| | | | | | 050 | 13 | — |
| | | | | | 055 | 15 | — |
| | ↓ | SH.SP | XX.X ΔF | SUPERHEAT SETPOINT | Default: 15 °F | | |
| | ↓ | REFG | X | REFRIGERANT | 1 = R-22 | | |
| | ↓ | FAN.S | | FAN STAGING SELECT | 1 = One Fan (010-018)<br>2 = Two Fans (022-030)<br>3 = Three Fans (032-040)<br>4 = Four Fans (042-055) | | |

NOTE: If the unit has a single circuit, the Circuit B items will not appear in the display, except the ability to configure circuit B will be displayed.

## Table 17 — Configuration Mode and Sub-Mode Directory (cont)

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|
| **OPT1** | | | | UNIT OPTIONS 1 HARDWARE | |
| | ENTER | FLUD | X | COOLER FLUID | Default: Water<br>1 = Water<br>2 = Medium Temperature Brine |
| | ↓ | MLV.S | YES/NO | MINIMUM LOAD VALVE SELECT | |
| | ↓ | MMR.S | YES/NO | MOTORMASTER SELECT | |
| | ↓ | RG.EN | ENBL/DSBL | RETURN GAS SENSOR ENABLE | Default: DISABLED |
| | ↓ | CPC | ON/OFF | COOLER PUMP CONTROL | Default: On |
| | ↓ | PM1E | YES/NO | COOLER PUMP 1 ENABLE | |
| | ↓ | PM2E | YES/NO | COOLER PUMP 2 ENABLE | |
| | ↓ | PM.P.S | YES/NO | COOLER PMP PERIODIC STRT | Default: No |
| | ↓ | PM.SL | X | COOLER PUMP SELECT | Default: Automatic<br>0 = Automatic<br>1 = Pump 1 Starts first<br>2 = Pump 2 Starts first |
| | ↓ | PM.DY | XX MIN | COOLER PUMP SHUTDOWN DLY | 0 to 10 minutes, Default: 1 min. |
| | ↓ | PM.DT | XXXX HRS | PUMP CHANGEOVER HOURS | Default: 500 hours |
| | ↓ | ROT.P | YES/NO | ROTATE COOLER PUMPS NOW | User Entry |
| | ↓ | EMM | YES/NO | EMM MODULE INSTALLED | |
| **OPT2** | | | | UNIT OPTIONS 2 CONTROLS | |
| | ENTER | CTRL | X | CONTROL METHOD | Default: Switch<br>0 = Enable/Off/Remote Switch<br>2 = Occupancy<br>3 = SCN Control |
| | ↓ | SCNA | XXX | SCN ADDRESS | Default: 1<br>Range: 1 to 239 |
| | ↓ | SCNB | XXX | SCN BUS NUMBER | Default: 0<br>Range: 0 to 239 |
| | ↓ | BAUD | X | SCN BAUD RATE | Default: 9600<br>1 = 2400<br>2 = 4800<br>3 = 9600<br>4 = 19,200<br>5 = 38,400 |
| | ↓ | LOAD | X | LOADING SEQUENCE SELECT | Default: Equal<br>1 = Equal<br>2 = Staged |
| | ↓ | LLCS | X | LEAD/LAG CIRCUIT SELECT | Default: Automatic<br>1 = Automatic<br>2 = Circuit A Leads<br>3 = Circuit B Leads |
| | ↓ | LCWT | XX.X ΔF | HIGH LCW ALERT LIMIT | Default: 60<br>Range: 2 to 60 °F |
| | ↓ | DELY | XX | MINUTES OFF TIME | Default: 0 Minutes<br>Range: 0 to 15 Minutes |
| | ↓ | ICE.M | ENBL/DSBL | ICE MODE ENABLE | Default: Disable |
| | ↓ | CLS.C | ENBL/DSBL | CLOSE CONTROL SELECT | Default: Disable |
| | ↓ | LS.MD | X | LOW SOUND MODE SELECT | Default: 0<br>0 = Mode Disable<br>1 = Fan Noise Only<br>2 = Fan/Compressor Noise |
| | ↓ | LS.ST | 00:00 | LOW SOUND START TIME | Default: 00:00 |
| | ↓ | LS.ND | 00:00 | LOW SOUND END TIME | Default: 00:00 |
| | ↓ | LS.LT | XXX % | LOW SOUND CAPACITY LIMIT | Default: 100%<br>Range: 0 to 100% |
| **RSET** | | | | RESET COOL TEMP | |
| | ENTER | CRST | X | COOLING RESET TYPE | Default: No Reset<br>0 = No Reset<br>1 = 4 to 20 mA Input<br>2 = Outdoor Air Temperature<br>3 = Return Fluid<br>4 = Space Temperature |
| | ↓ | MA.DG | XX.X ΔF | 4-20 - DEGREES RESET | Default: 0.0 ΔF<br>Range: –30 to 30 ΔF |
| | ↓ | RM.NO | XXX.X °F | REMOTE - NO RESET TEMP | Default: 125 F (51.7 C)<br>Range: 0° to 125 F |

## Table 17 — Configuration Mode and Sub-Mode Directory (cont)

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|
| **RSET (cont)** | ↓ | RM.F | XXX.X °F | REMOTE - FULL RESET TEMP | Default: 0.0° F (-17.8 C)<br>Range: 0° to 125 F |
| | ↓ | RM.DG | XX.X °F | REMOTE - DEGREES RESET | Default: 0.0° F<br>Range: –30 to 30 F |
| | ↓ | RT.NO | XXX.X ΔF | RETURN - NO RESET TEMP | Default: 10.0 ΔF (5.6 ΔC)<br>Range: 0° to 125 F COOLER ΔT |
| | ↓ | RT.F | XXX.X ΔF | RETURN - FULL RESET TEMP | Default: 0.0 ΔF (0.0 ΔC)<br>Range: 0° to 125 F COOLER ΔT |
| | ↓ | RT.DG | XX.X °F | RETURN - DEGREES RESET | Default: 0.0° F<br>Range: –30 to 30 F (–34.4 to -1.1 C) |
| | ↓ | DMDC | X | DEMAND LIMIT SELECT | Default: None<br>0 = None<br>1 = Switch<br>2 = 4 to 20 mA Input<br>3 = SCN Loadshed |
| | ↓ | DM20 | XXX % | DEMAND LIMIT AT 20 MA | Default: 100%<br>Range: 0 to 100% |
| | ↓ | SHNM | XXX | LOADSHED GROUP NUMBER | Default: 0<br>Range: 0 to 99 |
| | ↓ | SHDL | XXX % | LOADSHED DEMAND DELTA | Default: 0%<br>Range: 0 to 60% |
| | ↓ | SHTM | XXX | MAXIMUM LOADSHED TIME | Default: 60 minutes<br>Range: 0 to 120 minutes |
| | ↓ | DLS1 | XXX % | DEMAND LIMIT SWITCH 1 | Default: 80%<br>Range: 0 to 100% |
| | ↓ | DLS2 | XXX % | DEMAND LIMIT SWITCH 2 | Default: 50%<br>Range: 0 to 100% |
| | ↓ | LLEN | ENBL/DSBL | LEAD/LAG CHILLER ENABLE | Default: Disable |
| | ↓ | MSSL | SLVE/MAST | MASTER/SLAVE SELECT | Default: Master |
| | ↓ | SLVA | XXX | SLAVE ADDRESS | Default: 2<br>Range: 0 to 239 |
| | ENTER | LLBL | X | LEAD/LAG BALANCE SELECT | Default: Master Leads<br>0 = Master Leads<br>1 = Slave Leads<br>2 = Automatic |
| | ↓ | LLBD | XXX | LEAD/LAG BALANCE DELTA | Default: 168 hours<br>Range: 40 to 400 hours |
| | ↓ | LLDY | XXX | LAG START DELAY | Default: 5 minutes<br>Range: 0 to 30 minutes |
| | ↓ | PARA | YES | PARALLEL CONFIGURATION | Default: YES (CANNOT BE CHANGED) |
| **SLCT** | | | | SETPOINT AND RAMP LOAD | |
| | ENTER | CLSP | X | COOLING SETPOINT SELECT | Default: Single<br>0 = Single<br>1 = Dual Switch<br>2 = Dual SCN Occupied<br>3 = 4 to 20 mA Input (requires EMM) |
| | ↓ | RL.S | ENBL/DSBL | RAMP LOAD SELECT | Default: Enable |
| | ↓ | CRMP | X.X | COOLING RAMP LOADING | Default: 1.0<br>Range: 0.2 to 2.0 |
| | ↓ | SCHD | XX | SCHEDULE NUMBER | Default: 1<br>Range: 1 to 99 |
| | ↓ | Z.GN | X.X | DEADBAND MULTIPLIER | Default: 2.0<br>Range: 1.0 to 4.0 |
| **SERV** | | | | SERVICE CONFIGURATION | |
| | ENTER | EN.A1 | ENBL/DSBL | ENABLE COMPRESSOR A1 | Unit dependent |
| | ↓ | EN.A2 | ENBL/DSBL | ENABLE COMPRESSOR A2 | Unit dependent |
| | ↓ | EN.B1 | ENBL/DSBL | ENABLE COMPRESSOR B1 | Unit dependent |
| | ↓ | EN.B2 | ENBL/DSBL | ENABLE COMPRESSOR B2 | Unit dependent |
| **BCST** | | | | BROADCAST CONFIGURATION | |
| | ENTER | T.D.BC | ON/OFF | SCN TIME/DATE BROADCAST | |
| | ↓ | OAT.B | ON/OFF | SCN OAT BROADCAST | |
| | ↓ | G.S.BC | ON/OFF | GLOBAL SCHEDULE BROADCAST | |
| | ↓ | BC.AK | ON/OFF | SCN BROADCAST ACK'ER | |

## Table 18 — Time Clock Mode and Sub-Mode Directory

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | SUB-ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|---|---|
| **TIME** | | | | | | TIME OF DAY | |
| | ENTER | HH.MM | XX.XX | | | HOUR AND MINUTE | Military (00:00 – 23:59) |
| **DATE** | | | | | | MONTH,DATE,DAY AND YEAR | |
| | ENTER | MNTH | XX | | | MONTH OF YEAR | 1-12 (1 = January, 2 = February, etc) |
| | ↓ | DOM | XX | | | DAY OF MONTH | Range: 01-31 |
| | ↓ | DAY | X | | | DAY OF WEEK | 1-7 (1 = Sunday, 2 = Monday, etc) |
| | ↓ | YEAR | XXXX | | | YEAR OF CENTURY | |
| **DST** | | | | | | DAYLIGHT SAVINGS TIME | |
| | ENTER | STR.M | XX | | | MONTH | Default: 4, Range 1 – 12 |
| | ↓ | STR.W | X | | | WEEK | Default: 1, Range 1 – 5 |
| | ↓ | STR.D | X | | | DAY | Default: 7, Range 1 – 7 |
| | ↓ | MIN.A | XX | | | MINUTES TO ADD | Default: 60, Range 0 – 99 |
| | ↓ | STP.M | XX | | | MONTH | Default: 10, Range 1 – 12 |
| | ↓ | STP.W | XX | | | WEEK | Default: 5, Range 1 – 5 |
| | ↓ | STP.D | XX | | | DAY | Default: 7, Range 1 – 7 |
| | ↓ | MIN.5 | XX | | | MINUTES TO SUBTRACT | Default: 60, Range 0 – 99 |
| **SCH.N** | | | XX | | | SCHEDULE NUMBER | Default: 1, Range 1 – 99 |
| **SCH.L** | | | | | | LOCAL OCCUPANCY SCHEDULE | |
| | ENTER | PER.1 | | | | OCCUPANCY PERIOD 1 | |
| | ENTER | | | OCC.1 | XX:XX | PERIOD OCCUPIED TIME | Military (00:00 – 23:59) |
| | ↓ | | | UNC.1 | XX.XX | PERIOD UNOCCUPIED TIME | Military (00:00 – 23:59) |
| | ↓ | | | MON.1 | YES/NO | MONDAY IN PERIOD | |
| | ↓ | | | TUE.1 | YES/NO | TUESDAY IN PERIOD | |
| | ↓ | | | WED.1 | YES/NO | WEDNESDAY IN PERIOD | |
| | ↓ | | | THU.1 | YES/NO | THURSDAY IN PERIOD | |
| | ↓ | | | FRI.1 | YES/NO | FRIDAY IN PERIOD | |
| | ↓ | | | SAT.1 | YES/NO | SATURDAY IN PERIOD | |
| | ↓ | | | SUN.1 | YES/NO | SUNDAY IN PERIOD | |
| | ↓ | | | HOL.1 | YES/NO | HOLIDAY IN PERIOD | |
| | ENTER | PER.2 | | | | OCCUPANCY PERIOD 2 | |
| | ENTER | | | OCC.2 | XX:XX | PERIOD OCCUPIED TIME | Military (00:00 – 23:59) |
| | ↓ | | | UNC.2 | XX.XX | PERIOD UNOCCUPIED TIME | Military (00:00 – 23:59) |
| | ↓ | | | MON.2 | YES/NO | MONDAY IN PERIOD | |
| | ↓ | | | TUE.2 | YES/NO | TUESDAY IN PERIOD | |
| | ↓ | | | WED.2 | YES/NO | WEDNESDAY IN PERIOD | |
| | ↓ | | | THU.2 | YES/NO | THURSDAY IN PERIOD | |
| | ↓ | | | FRI.2 | YES/NO | FRIDAY IN PERIOD | |
| | ↓ | | | SAT.2 | YES/NO | SATURDAY IN PERIOD | |
| | ↓ | | | SUN.2 | YES/NO | SUNDAY IN PERIOD | |
| | ↓ | | | HOL.2 | YES/NO | HOLIDAY IN PERIOD | |

## Table 18 — Time Clock Mode and Sub-Mode Directory (cont)

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | SUB-ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|---|---|
| SCH.L (cont) | ENTER | PER.3 | | | | OCCUPANCY PERIOD 3 | |
| | ENTER | | | OCC.3 | XX:XX | PERIOD OCCUPIED TIME | Military (00:00 – 23:59) |
| | ↓ | | | UNC.3 | XX.XX | PERIOD UNOCCUPIED TIME | Military (00:00 – 23:59) |
| | ↓ | | | MON.3 | YES/NO | MONDAY IN PERIOD | |
| | ↓ | | | TUE.3 | YES/NO | TUESDAY IN PERIOD | |
| | ↓ | | | WED.3 | YES/NO | WEDNESDAY IN PERIOD | |
| | ↓ | | | THU.3 | YES/NO | THURSDAY IN PERIOD | |
| | ↓ | | | FRI.3 | YES/NO | FRIDAY IN PERIOD | |
| | ↓ | | | SAT.3 | YES/NO | SATURDAY IN PERIOD | |
| | ↓ | | | SUN.3 | YES/NO | SUNDAY IN PERIOD | |
| | ↓ | | | HOL.3 | YES/NO | HOLIDAY IN PERIOD | |
| | ENTER | PER.4 | | | | OCCUPANCY PERIOD 4 | |
| | ENTER | | | OCC.4 | XX:XX | PERIOD OCCUPIED TIME | Military (00:00 – 23:59) |
| | ↓ | | | UNC.4 | XX.XX | PERIOD UNOCCUPIED TIME | Military (00:00 – 23:59) |
| | ↓ | | | MON.4 | YES/NO | MONDAY IN PERIOD | |
| | ↓ | | | TUE.4 | YES/NO | TUESDAY IN PERIOD | |
| | ↓ | | | WED.4 | YES/NO | WEDNESDAY IN PERIOD | |
| | ↓ | | | THU.4 | YES/NO | THURSDAY IN PERIOD | |
| | ↓ | | | FRI.4 | YES/NO | FRIDAY IN PERIOD | |
| | ↓ | | | SAT.4 | YES/NO | SATURDAY IN PERIOD | |
| | ↓ | | | SUN.4 | YES/NO | SUNDAY IN PERIOD | |
| | ↓ | | | HOL.4 | YES/NO | HOLIDAY IN PERIOD | |
| | ENTER | PER.5 | | | | OCCUPANCY PERIOD 5 | |
| | ENTER | | | OCC.5 | XX:XX | PERIOD OCCUPIED TIME | Military (00:00 – 23:59) |
| | ↓ | | | UNC.5 | XX.XX | PERIOD UNOCCUPIED TIME | Military (00:00 – 23:59) |
| | ↓ | | | MON.5 | YES/NO | MONDAY IN PERIOD | |
| | ↓ | | | TUE.5 | YES/NO | TUESDAY IN PERIOD | |
| | ↓ | | | WED.5 | YES/NO | WEDNESDAY IN PERIOD | |
| | ↓ | | | THU.5 | YES/NO | THURSDAY IN PERIOD | |
| | ↓ | | | FRI.5 | YES/NO | FRIDAY IN PERIOD | |
| | ↓ | | | SAT.5 | YES/NO | SATURDAY IN PERIOD | |
| | ↓ | | | SUN.5 | YES/NO | SUNDAY IN PERIOD | |
| | ↓ | | | HOL.5 | YES/NO | HOLIDAY IN PERIOD | |
| | ENTER | PER.6 | | | | OCCUPANCY PERIOD 6 | |
| | ENTER | | | OCC.6 | XX:XX | PERIOD OCCUPIED TIME | Military (00:00 – 23:59) |
| | ↓ | | | UNC.6 | XX.XX | PERIOD UNOCCUPIED TIME | Military (00:00 – 23:59) |
| | ↓ | | | MON.6 | YES/NO | MONDAY IN PERIOD | |
| | ↓ | | | TUE.6 | YES/NO | TUESDAY IN PERIOD | |
| | ↓ | | | WED.6 | YES/NO | WEDNESDAY IN PERIOD | |

## Table 18 — Time Clock Mode and Sub-Mode Directory (cont)

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | SUB-ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|---|---|
| SCH.L (cont) | ↓ | | | THU.6 | YES/NO | THURSDAY IN PERIOD | |
| | ↓ | | | FRI.6 | YES/NO | FRIDAY IN PERIOD | |
| | ↓ | | | SAT.6 | YES/NO | SATURDAY IN PERIOD | |
| | ↓ | | | SUN.6 | YES/NO | SUNDAY IN PERIOD | |
| | ↓ | | | HOL.6 | YES/NO | HOLIDAY IN PERIOD | |
| | ENTER | PER.7 | | | | OCCUPANCY PERIOD 7 | |
| | ENTER | | | OCC.7 | XX:XX | PERIOD OCCUPIED TIME | Military (00:00 – 23:59) |
| | ↓ | | | UNC.7 | XX.XX | PERIOD UNOCCUPIED TIME | Military (00:00 – 23:59) |
| | ↓ | | | MON.7 | YES/NO | MONDAY IN PERIOD | |
| | ↓ | | | TUE.7 | YES/NO | TUESDAY IN PERIOD | |
| | ↓ | | | WED.7 | YES/NO | WEDNESDAY IN PERIOD | |
| | ↓ | | | THU.7 | YES/NO | THURSDAY IN PERIOD | |
| | ↓ | | | FRI.7 | YES/NO | FRIDAY IN PERIOD | |
| | ↓ | | | SAT.7 | YES/NO | SATURDAY IN PERIOD | |
| | ↓ | | | SUN.7 | YES/NO | SUNDAY IN PERIOD | |
| | ↓ | | | HOL.7 | YES/NO | HOLIDAY IN PERIOD | |
| | ENTER | PER.8 | | | | OCCUPANCY PERIOD 8 | |
| | ENTER | | | OCC.8 | XX:XX | PERIOD OCCUPIED TIME | Military (00:00 – 23:59) |
| | ↓ | | | UNC.8 | XX.XX | PERIOD UNOCCUPIED TIME | Military (00:00 – 23:59) |
| | ↓ | | | MON.8 | YES/NO | MONDAY IN PERIOD | |
| | ↓ | | | TUE.8 | YES/NO | TUESDAY IN PERIOD | |
| | ↓ | | | WED.8 | YES/NO | WEDNESDAY IN PERIOD | |
| | ↓ | | | THU.8 | YES/NO | THURSDAY IN PERIOD | |
| | ↓ | | | FRI.8 | YES/NO | FRIDAY IN PERIOD | |
| | ↓ | | | SAT.8 | YES/NO | SATURDAY IN PERIOD | |
| | ↓ | | | SUN.8 | YES/NO | SUNDAY IN PERIOD | |
| | ↓ | | | HOL.8 | YES/NO | HOLIDAY IN PERIOD | |
| OVR | | | | | | SCHEDULE OVERRIDE | |
| | ENTER | OVR.T | X | | | TIMED OVERRIDE HOURS | Default: 0, Range 0-4 hours |
| | ↓ | OVR.L | X | | | OVERRIDE TIME LIMIT | Default: 0, Range 0-4 hours |
| | ↓ | T.OVR | YES/NO | | | TIMED OVERRIDE | User Entry |

## Table 19 — Operating Mode and Sub-Mode Directory

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|
| **MODE** | | | | MODES CONTROLLING UNIT | |
| | ENTER | MD01 | ON/OFF | FSM CONTROLLING CHILLER | |
| | ↓ | MD02 | ON/OFF | WSM CONTROLLING CHILLER | |
| | ↓ | MD03 | ON/OFF | MASTER/SLAVE CONTROL | |
| | ↓ | MD05 | ON/OFF | RAMP LOAD LIMITED | |
| | ↓ | MD06 | ON/OFF | TIMED OVERRIDE IN EFFECT | |
| | ↓ | MD07 | ON/OFF | LOW COOLER SUCTION TEMPA | |
| | ↓ | MD08 | ON/OFF | LOW COOLER SUCTION TEMPB | |
| | ↓ | MD09 | ON/OFF | SLOW CHANGE OVERRIDE | |
| | ↓ | MD10 | ON/OFF | MINIMUM OFF TIME ACTIVE | |
| | ↓ | MD13 | ON/OFF | DUAL SETPOINT | |
| | ↓ | MD14 | ON/OFF | TEMPERATURE RESET | |
| | ↓ | MD15 | ON/OFF | DEMAND/SOUND LIMITED | |
| | ↓ | MD16 | ON/OFF | COOLER FREEZE PROTECTION | |
| | ↓ | MD17 | ON/OFF | LOW TEMPERATURE COOLING | |
| | ↓ | MD18 | ON/OFF | HIGH TEMPERATURE COOLING | |
| | ↓ | MD19 | ON/OFF | MAKING ICE | |
| | ↓ | MD20 | ON/OFF | STORING ICE | |
| | ↓ | MD21 | ON/OFF | HIGH SCT CIRCUIT A | |
| | ↓ | MD22 | ON/OFF | HIGH SCT CIRCUIT B | |
| | ↓ | MD23 | ON/OFF | MINIMUM COMP ON TIME | |
| | ↓ | MD24 | ON/OFF | PUMP OFF DELAY TIME | |
| | ↓ | MD25 | ON/OFF | LOW SOUND MODE | |
| | ↓ | MD26 | ON/OFF | SHORT LOOP OVERRIDE | |

LEGEND

**FSM** — Flotronic™ System Manager
**SCT** — Saturated Condensing Temperature
**WSM** — Water System Manager

## Table 20 — Alarms Mode and Sub-Mode Directory

| SUB-MODE | KEYPAD ENTRY | ITEM | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|
| **CRNT** | ENTER | AXXX OR TXXX | CURRENTLY ACTIVE ALARMS | Alarms are shown as AXXX.<br>Alerts are shown as TXXX. |
| **RCRN** | ENTER | YES/NO | RESET ALL CURRENT ALARMS | |
| **HIST** | ENTER | AXXX OR TXXX | ALARM HISTORY | Alarms are shown as AXXX.<br>Alerts are shown as TXXX. |

## Table 21 — Dual Chiller Configuration (Master Chiller Example)

| SUB-MODE | ITEM | KEYPAD ENTRY | DISPLAY | ITEM EXPANSION | COMMENTS |
|---|---|---|---|---|---|
| DISP | | | | | |
| UNIT | | | | | |
| OPT1 | | | | | |
| OPT2 | | ENTER | CTRL | CONTROL METHOD | |
| | CTRL | ENTER | 0 | SWITCH | DEFAULT 0 |
| | | ESCAPE | CTRL | | |
| | | ENTER | SCNA | | |
| | SCNA | ENTER | 1 | SCN ADDRESS | DEFAULT 1 |
| | | ESCAPE | SCNA | | |
| | | ↓ | SCNB | | |
| | SCNB | ENTER | 0 | SCN BUS NUMBER | DEFAULT 0 |
| | | ESCAPE | SCNB | | |
| | | ESCAPE | OPT2 | | |
| | | ↓ | RSET | | PROCEED TO SUBMODE **RESET** |
| RSET | | ENTER | CRST | COOLING RESET TYPE | |
| | | ↓ | LLEN | LEAD/LAG CHILLER ENABLE | ↓ 15 ITEMS |
| | LLEN | ENTER | DSBL | | SCROLLING STOPS |
| | | ENTER | DSBL | | VALUE FLASHES |
| | | ↑ | ENBL | | SELECT ENBL |
| | LLEN | ENTER | ENBL | LEAD/LAG CHILLER ENABLE | CHANGE ACCEPTED |
| | | ESCAPE | LLEN | | |
| | | ↓ | MSSL | MASTER /SLAVE SELECT | |
| | MSSL | ENTER | MAST | MASTER /SLAVE SELECT | DEFAULT MAST |
| | | ESCAPE | MSSL | | |
| | | ↓ | SLVA | SLAVE ADDRESS | |
| | SLVA | ENTER | 0 | | SCROLLING STOPS |
| | | ENTER | 0 | | VALUE FLASHES |
| | | ↑ | 2 | | SELECT 2 |
| | SLVA | ENTER | 2 | SLAVE ADDRESS | CHANGE ACCEPTED |
| | | ESCAPE | SLVA | | |
| | | ↓ | LLBL | LEAD/LAG BALANCE SELECT | |
| | LLBL | ENTER | 0 | | SCROLLING STOPS |
| | | ENTER | 0 | | VALUE FLASHES |
| | | ↑ | 2 | | SELECT 2 - Automatic |

## Table 21 — Dual Chiller Configuration (Master Chiller Example) (cont)

| SUB-MODE | ITEM | KEYPAD ENTRY | DISPLAY | ITEM EXPANSION | COMMENTS |
|---|---|---|---|---|---|
| RSET | LLBL | ENTER | 2 | LEAD/LAG BALANCE SELECT | CHANGE ACCEPTED |
| | | ESCAPE | LLBL | | |
| | | ↓ | LLBD | LEAD/LAG BALANCE DELTA | |
| | LLBD | ENTER | 168 | LEAD/LAG BALANCE DELTA | DEFAULT 168 |
| | | ESCAPE | LLBD | | |
| | | ↓ | LLDY | LAG START DELAY | |
| | LLDY | ENTER | 5 | | SCROLLING STOPS |
| | | ENTER | 5 | | VALUE FLASHES |
| | | ↑ | 10 | | SELECT 10 |
| | LLDY | ENTER | 10 | LAG START DELAY | CHANGE ACCEPTED |
| | | ESCAPE | LLDY | | |
| | | ESCAPE | RSET | | |
| | PARA | ENTER | YES | | MASTER COMPLETE |

NOTES:
1. Master Control Method (CTRL) can be configured as 0-Switch, 2-Occupancy or 3-SCN.
2. Parallel Configuration (PARA) cannot be changed.

## Table 22 — Dual Chiller Configuration (Slave Chiller Example)

| SUB-MODE | ITEM | KEYPAD ENTRY | DISPLAY | ITEM EXPANSION | COMMENTS |
|---|---|---|---|---|---|
| DISP | | | | | |
| UNIT | | | | | |
| OPT1 | | | | | |
| OPT2 | | ENTER | CTRL | CONTROL METHOD | |
| | CTRL | | 0 | SWITCH | DEFAULT 0 |
| | | ESCAPE | CTRL | | |
| | CTRL | ↓ | SCNA | | |
| | SCNA | ENTER | 1 | SCN ADDRESS | SCROLLING STOPS |
| | | ENTER | 1 | | VALUE FLASHES |
| | | ↑ | 2 | | SELECT 2 (SEE NOTE 1) |
| | SCNA | ENTER | 2 | SCN ADDRESS | CHANGE ACCEPTED |
| | | ESCAPE | SCNA | | |
| | | ↓ | SCNB | | |
| | SCNB | ENTER | 0 | SCN BUS NUMBER | DEFAULT 0 (SEE NOTE 2) |
| | | ESCAPE | SCNB | | |
| | | ESCAPE | OPT2 | | |
| | | ↓ | RSET | | PROCEED TO SUBMODE **RSET** |
| RSET | | ENTER | CRST | COOLING RESET TYPE | |
| | | ↓ | LLEN | LEAD/LAG CHILLER ENABLE | ↓ 15 ITEMS |
| | LLEN | ENTER | DSBL | | SCROLLING STOPS |
| | | ENTER | DSBL | | VALUE FLASHES |
| | | ↑ | ENBL | | SELECT ENBL |
| | LLEN | ENTER | ENBL | LEAD/LAG CHILLER ENABLE | CHANGE ACCEPTED |
| | | ESCAPE | LLEN | | |
| | | ↓ | MSSL | MASTER /SLAVE SELECT | |
| | MSSL | ENTER | MAST | | SCROLLING STOPS |
| | | ENTER | MAST | | VALUE FLASHES |
| | | ↑ | SLVE | | SELECT SLVE |
| | MSSL | ENTER | SLVE | MASTER /SLAVE SELECT | CHANGE ACCEPTED |
| | | ESCAPE | MSSL | | |
| | | ESCAPE | RSET | | SLAVE COMPLETE |

NOTES:
1. Slave Control Method (CTRL) must be configured for 0.
2. Slave SCN Address (SCNA) must be different than Master.
3. Slave SCN Bus Number (SCNB) must be the same as Master
4. Slave does not require SLVA, LLBL, LLBD, or LLDY to be configured.

## Table 23 — Operating Modes

| MODE NO. | ITEM EXPANSION | DESCRIPTION |
|---|---|---|
| 01 | FSM CONTROLLING CHILLER | Flotronic™ System Manager (FSM) is controlling the chiller. |
| 02 | WSM CONTROLLING CHILLER | Water System Manager (WSM) is controlling the chiller. |
| 03 | MASTER/SLAVE CONTROL | Dual Chiller control is enabled. |
| 05 | RAMP LOAD LIMITED | Ramp load (pull-down) limiting in effect. In this mode, the rate at which leaving fluid temperature is dropped is limited to a predetermined value to prevent compressor overloading. See Cooling Ramp Loading (CRMP) [Configuration, SLCT]. The pull-down limit can be modified, if desired, to any rate from 0.2° F to 2° F (0.1° to 1° C)/minute. |
| 06 | TIMED OVERRIDE IN EFFECT | Timed override is in effect. This is a 1 to 4 hour temporary override of the programmed schedule, forcing unit to Occupied mode. Override can be implemented with unit under Local (Enable) or SCN (Sterlco Comfort Network) control. Override expires after each use. |
| 07 | LOW COOLER SUCTION TEMPA | Circuit A cooler Freeze Protection mode. At least one compressor must be on, and the Saturated Suction Temperature is not increasing greater than 1.1° F (0.6° C) in 10 seconds. If the saturated suction temperature is less than the Brine Freeze Point (BR.FZ) [Set Point, FRZ] minus 3° F (1.7° C) and less than the leaving fluid temperature minus 14° F (7.8° C) for 2 minutes, a stage of capacity will be removed from the circuit. Or, If the saturated suction temperature is less than the Brine Freeze Point (BR.FZ) [Set Point, FRZ] minus 14° F (7.8 º C), for 90 seconds, a stage of capacity will be removed from the circuit. The control will continue to decrease capacity as long as either condition exists. |
| 08 | LOW COOLER SUCTION TEMPB | Circuit B cooler Freeze Protection mode. At least one compressor must be on, and the Saturated Suction Temperature is not increasing greater than 1.1° F (0.6° C) in 10 seconds. If the saturated suction temperature is less than the Brine Freeze Point (BR.FZ) [Set Point, FRZ] minus 3° F (1.7° C) and less than the leaving fluid temperature minus 14° F (7.8° C) for 2 minutes, a stage of capacity will be removed from the circuit. Or, If the saturated suction temperature is less than the Brine Freeze Point (BR.FZ) [Set Point, FRZ] minus 14° F (7.8° C), for 90 seconds, a stage of capacity will be removed from the circuit. The control will continue to decrease capacity as long as either condition exists. |
| 09 | SLOW CHANGE OVERRIDE | Slow change override is in effect. The leaving fluid temperature is close to and moving towards the control point. |
| 10 | MINIMUM OFF TIME ACTIVE | Chiller is being held off by Minutes Off Time (DELY) [Configuration, OPT2]. |
| 13 | DUAL SETPOINT | Dual Set Point mode is in effect. Chiller controls to Cooling Set Point 1 (CSP.1) [Set Point, COOL] during occupied periods and Cooling Set Point 2 (CSP.2) [Set Point, COOL] during unoccupied periods. |
| 14 | TEMPERATURE RESET | Temperature reset is in effect. In this mode, chiller is using temperature reset to adjust leaving fluid set point upward and is currently controlling to the modified set point. The set point can be modified based on return fluid, outdoor-air-temperature, space temperature, or 4 to 20 mA signal. |
| 15 | DEMAND/SOUND LIMITED | Demand limit is in effect. This indicates that the capacity of the chiller is being limited by demand limit control option. Because of this limitation, the chiller may not be able to produce the desired leaving fluid temperature. Demand limit can be controlled by switch inputs or a 4 to 20 mA signal. |
| 16 | COOLER FREEZE PROTECTION | Cooler fluid temperatures are approaching the Freeze point (see Alarms and Alerts section for definition). The chiller will be shut down when either fluid temperature falls below the Freeze point. |
| 17 | LOW TEMPERATURE COOLING | Chiller is in Cooling mode and the rate of change of the leaving fluid is negative and decreasing faster than -0.5° F per minute. Error between leaving fluid and control point exceeds fixed amount. Control will automatically unload the chiller if necessary. |
| 18 | HIGH TEMPERATURE COOLING | Chiller is in Cooling mode and the rate of change of the leaving fluid is positive and increasing. Error between leaving fluid and control point exceeds fixed amount. Control will automatically load the chiller if necessary to better match the increasing load. |
| 19 | MAKING ICE | Chiller is in an unoccupied mode and is using Cooling Set Point 3 (CSP.3) [Set Point, COOL] to make ice. The ice done input to the Energy Management Module (EMM) is open. |
| 20 | STORING ICE | Chiller is in an unoccupied mode and is controlling to Cooling Set Point 2 (CSP.2) [Set Point COOL]. The ice done input to the Energy Management Module (EMM) is closed. |
| 21 | HIGH SCT CIRCUIT A | Chiller is in a Cooling mode and the Saturated Condensing Temperature (SCT) is greater than the calculated maximum limit. No additional stages of capacity will be added. Chiller capacity may be reduced if SCT continues to rise to avoid high-pressure switch trips by reducing condensing temperature. |
| 22 | HIGH SCT CIRCUIT B | Chiller is in a Cooling mode and the Saturated Condensing Temperature (SCT) is greater than the calculated maximum limit. No additional stages of capacity will be added. Chiller capacity may be reduced if SCT continues to rise to avoid high-pressure switch trips by reducing condensing temperature. |
| 23 | MINIMUM COMP ON TIME | Cooling load may be satisfied, however control continues to operate compressor to ensure proper oil return. May be an indication of oversized application, low fluid flow rate or low loop volume. |
| 24 | PUMP OFF DELAY TIME | Cooling load is satisfied, however cooler pump continues to run for the number of minutes set by the configuration variable Cooler Pump Shutdown Delay (PM.DY) [Configuration, OPT1]. |
| 25 | LOW SOUND MODE | Chiller operates at higher condensing temperature and/or reduced capacity to minimize overall unit noise during evening/night hours (user-configurable). |
| 26 | SHORT LOOP OVERRIDE | Chiller is monitoring how fast compressor(s) is being cycled to maintain the desired leaving fluid temperature. Control is limiting the rate of compressor cycling when this mode is active to ensure proper oil return and also to prevent premature compressor failure. Low loop volume, low cooler flow and/or low chiller load are the primary causes for this mode. |

## Table 24 — Example of Reading and Clearing Alarms

| SUB-MODE | KEYPAD ENTRY | ITEM | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|
| CRNT | ENTER | AXXX or TXXX | CURRENTLY ACTIVE ALARMS | ACTIVE ALARMS (AXXX) OR ALERTS (TXXX) DISPLAYED. |
| CRNT | ESCAPE | | | |
| RCRN | ▼ | NO | | Use to clear active alarms/alerts |
| | ENTER | NO | | NO Flashes |
| | ▲ | YES | | Select YES |
| | ENTER | NO | | Alarms/alerts clear, YES changes to NO |

## Table 25A — 4-20 mA Reset

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|
| RSET | ENTER | CRST | 1 | COOLING RESET TYPE | 0 = no reset<br>1 = 4 to 20 mA input<br>2 = Outdoor air temp<br>3 = Return Fluid<br>4 = Space Temperature |
| | ▼ | CRT1 | 4.0 | NO COOL RESET TEMP | Default: 125 F (51.7 C)<br>Range: 0° to 125 F |
| | ▼ | CRT2 | 20.0 | FULL COOL RESET TEMP | Default: 0° F (–17.8 C)<br>Range: 0° to 125 F |
| | ▼ | DGRC | 5.0 F (2.8 C) | DEGREES COOL RESET | Default: 0° F (0° C) Reset at 20 mA<br>Range: –30 to 30 F (–16.7 to 16.7 C) |

NOTE: The example above shows how to configure the chiller for 4-20 mA reset. No reset will occur at 4.0 mA input, and a 5.0 F reset will occur at 20.0 mA. An EMM is required.

## Table 25B — Menu Configuration of 4 to 20 mA Cooling Set Point Control

| MODE (RED LED) | KEYPAD ENTRY | SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|---|---|
| CONFIGURATION | ENTER | DISP | | | | | |
| | ▼ | UNIT | | | | | |
| | ▼ | OPT1 | | | | | |
| | ▼ | OPT2 | | | | | |
| | ▼ | RSET | | | | | |
| | ▼ | SLCT | ENTER | CLSP | 0 | COOLING SETPOINT SELECT | |
| | | | ENTER | | 0 | | Scrolling Stops |
| | | | ENTER | | 0 | | Flashing ‘0’ |
| | | | ▲ | | 4 | | Select ‘4’ |
| | | | ENTER | | 4 | | Change Accepted |

**Table 26A — Configuring Outdoor Air and Space Temperature Reset**

| MODE (RED LED) | KEYPAD ENTRY | SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|---|---|---|
| | | | | | Outdoor Air | Space | | |
| CONFIGURATION | ENTER | DISP | | | | | | |
| | ▼ | UNIT | | | | | | |
| | ▼ | OPT1 | | | | | | |
| | ▼ | OPT2 | | | | | | |
| | ▼ | RSET | ENTER | CRST | 2 | 4 | COOLING RESET TYPE | 2 = Outdoor-Air Temperature<br>4 = Space Temperature<br>(Connect to TB5-5,6) |
| | | | ▼ | RM.NO* | 85 °F | 72 °F | REMOTE - NO RESET TEMP | Default: 125.0 F (51.7 C)<br>Range: 0° to125 F |
| | | | ▼ | RM.F | 55 °F | 68 °F | REMOTE - FULL RESET TEMP | Default: 0.0° F (-17.7 C)<br>Range: 0° to 125 F |
| | | | ▼ | RM.DG | 15 °F | 6 °F | REMOTE - DEGREES RESET | Default: 0° F (0° C)<br>Range: –30 to 30 F<br>(–34.4 to -1.1 °C) |

*4 items skipped in this example.

**Table 26B — Configuring Return Temperature Reset**

| MODE (RED LED) | KEYPAD ENTRY | SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|---|---|
| CONFIGURATION | ENTER | DISP | ENTER | TEST | ON/OFF | TEST DISPLAY LEDs | |
| | ▼ | UNIT | ENTER | TYPE | X | UNIT TYPE | |
| | ▼ | OPT1 | ENTER | FLUD | X | COOLER FLUID | |
| | ▼ | OPT2 | ENTER | CTRL | X | CONTROL METHOD | |
| | ▼ | RSET | ENTER | CRST | X | COOLING RESET TYPE | 0 = No Reset<br>1 = 4 to 20 mA Input (EMM required)<br>(Connect to EMM TB6-2,3)<br>2 = Outdoor-Air Temperature<br>3 = Return Fluid<br>4 = Space Temperature<br>(Connect to TB5-5,6) |
| | | | ▼ | RT.NO* | XXX.X ΔF | RETURN FLUID - NO RESET TEMP | Default: 10.0 ΔF (5.6 ΔC)<br>Range: 0° to125 F COOLER ΔT |
| | | | ▼ | RT.F | XXX.X ΔF | RETURN FLUID - FULL RESET TEMP | Default: 0 ΔF (–17.8 ΔC)<br>Range: 0° to 125 F COOLER ΔT |
| | | | ▼ | RT.DG | XX.X ΔF | RETURN - DEGREES RESET | Default: 0 ΔF (0 ΔC)<br>Range: –30 to 30°F (–16.7 to 16.7 C) |

*4 items skipped in this example.

**Temperature Reset —** The control system is capable of handling leaving-fluid temperature reset based on return cooler fluid temperature. Because the change in temperature through the cooler is a measure of the building load, the return temperature reset is in effect an average building load reset method. The control system is also capable of temperature reset based on outdoor-air temperature (OAT), space temperature (SPT), or from an externally powered 4 to 20 mA signal. Accessory sensors must be used for SPT reset (33ZCT55SPT). The Energy Management Module (EMM) must be used for temperature reset using a 4 to 20 mA signal. See Tables 25A and 25B.

IMPORTANT: Care should be taken when interfacing with other control systems due to possible power supply differences: full wave bridge versus half wave rectification. Connection of control devices with different power supplies may result in permanent damage. *Comfort*Link™ controls incorporate power supplies with half wave rectification. A signal isolation device should be utilized if the signal generator incorporates a full wave bridge rectifier.

To use Outdoor Air or Space Temperature reset, four variables must be configured. In the Configuration mode under the sub-mode RSET, items CRST, RM.NO, RM.F and RT.DG must be properly set. See Table 26A — Configuring Outdoor Air and Space Temperature Reset. The outdoor air reset example provides 0° F (0° C) chilled water set point reset at 85.0 F (29.4 C) outdoor-air temperature and 15.0 F (8.3 C) reset at 55.0 F (12.8 C) outdoor-air temperature. The space temperature reset example provides 0° F (0° C) chilled water set point reset at 72.0 F (22.2 C) space temperature and 6.0 F (3.3 C) reset at 68.0 F (20.0 C) space temperature. The variable CRST should be configured for the type of reset desired. The variable RM.NO should be set to the temperature that no reset should occur. The variable RM.F should be set to the temperature that maximum reset is to occur. The variable RM.DG should be set to the maximum amount of reset desired.

To use Return reset, four variables must be configured. In the Configuration mode under the sub-mode RSET, items CRST, RT.NO, RT.F and RT.DG must be properly set. See Table 26B — Configuring Return Temperature Reset. This example provides 5.0 F (2.8 C) chilled water set point reset at

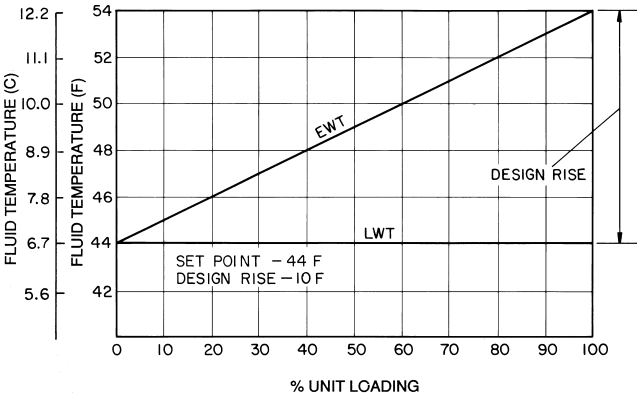
2.0 F (1.1 C) cooler ΔT and 0° F (0° C) reset at 10.0 F (5.6 C) cooler ΔT. The variable RT.NO should be set to the cooler temperature difference (ΔT) where no chilled water temperature reset should occur. The variable RT.F should be set to the cooler temperature difference where the maximum chilled water temperature reset should occur. The variable RM.DG should be set to the maximum amount of reset desired.

To verify that reset is functioning correctly proceed to Run Status mode, sub-mode VIEW, and subtract the active set point (SETP) from the control point (CTPT) to determine the degrees reset.

Under normal operation, the chiller will maintain a constant leaving fluid temperature approximately equal to the chilled fluid set point. As the cooler load varies, the entering cooler fluid will change in proportion to the load as shown in Fig. 18. Usually the chiller size and leaving-fluid temperature set point are selected based on a full-load condition. At part load, the fluid temperature set point may be colder than required. If the leaving fluid temperature was allowed to increase at part load, the efficiency of the machine would increase.

Return temperature reset allows for the leaving temperature set point to be reset upward as a function of the return fluid temperature or, in effect, the building load.

Figures 19 and 20 are examples of outdoor air and space temperature resets.




LEGEND

**EWT** — Entering Water (Fluid) Temperature
**LWT** — Leaving Water (Fluid) Temperature

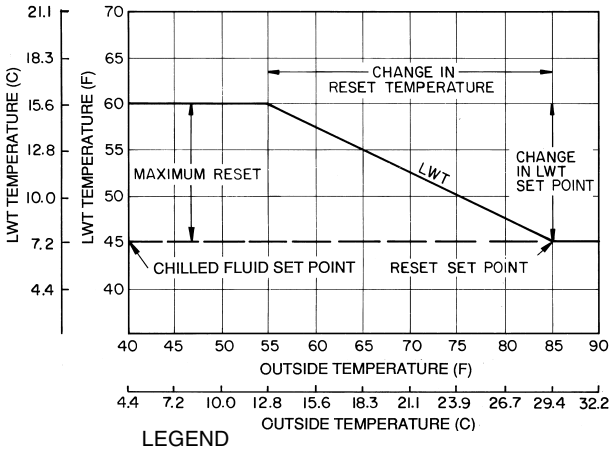
**Fig. 18 — Standard Chilled Fluid Temperature Control — No Reset**

**Demand Limit —** Demand Limit is a feature that allows the unit capacity to be limited during periods of peak energy usage. There are 3 types of demand limiting that can be configured. The first type is through 2-stage switch control, which will reduce the maximum capacity to 2 user-configurable percentages. The second type is by 4 to 20 mA signal input which will reduce the maximum capacity linearly between 100% at a 4 mA input signal (no reduction) down to the user-configurable level at a 20 mA input signal. The third type uses the CNN Loadshed module and has the ability to limit the current operating capacity to maximum and further reduce the capacity if required.

NOTE: The 2-stage switch control and 4- to 20-mA input signal types of demand limiting require the Energy Management Module (EMM).

To use Demand Limit, select the type of demand limiting to use. Then configure the Demand Limit set points based on the type selected.

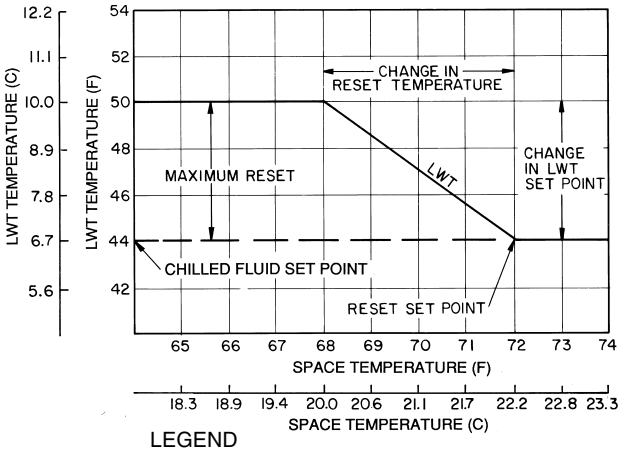
DEMAND LIMIT (2-Stage Switch Controlled) — To configure Demand Limit for 2-stage switch control set the Demand Limit Select (DMDC) [Configuration, RSET] to 1. Then




LEGEND

**LWT** — Leaving Water (Fluid) Temperature

**Fig. 19 — Outdoor-Air Temperature Reset**




LEGEND

**LWT** — Leaving Water (Fluid) Temperature

**Fig. 20 — Space Temperature Reset**

configure the 2 Demand Limit Switch points (DLS1 and DLS2) [Configuration, RSET] to the desired capacity limit. See Table 27. Capacity steps are controlled by 2 relay switch inputs field wired to TB6 as shown in Fig. 4-6.

For Demand Limit by 2-stage switch control, closing the first stage demand limit contact will put the unit on the first demand limit level. The unit will not exceed the percentage of capacity entered as Demand Limit Switch 1 set point. Closing contacts on the second demand limit switch prevents the unit from exceeding the capacity entered as Demand Limit Switch 2 set point. The demand limit stage that is set to the lowest demand takes priority if both demand limit inputs are closed. If the demand limit percentage does not match unit staging, the unit will limit capacity to the closest capacity stage.

To disable demand limit configure the DMDC to 0. See Table 27.

EXTERNALLY POWERED DEMAND LIMIT (4 to 20 mA Controlled) — To configure Demand Limit for 4 to 20 mA control set the Demand Limit Select (DMDC) [Configuration, RSET] to 2. Then configure the Demand Limit at 20 mA (DM20) [Configuration, RSET] to the maximum loadshed value desired. Connect the output from an externally powered 4 to 20 mA signal to terminal block TB6, terminals 1 and 5. Refer to the unit wiring diagram for these connections to the optional/accessory Energy Management Module and terminal block. The control will reduce allowable capacity to this level for the 20 mA signal. See Table 27 and Fig. 21A.

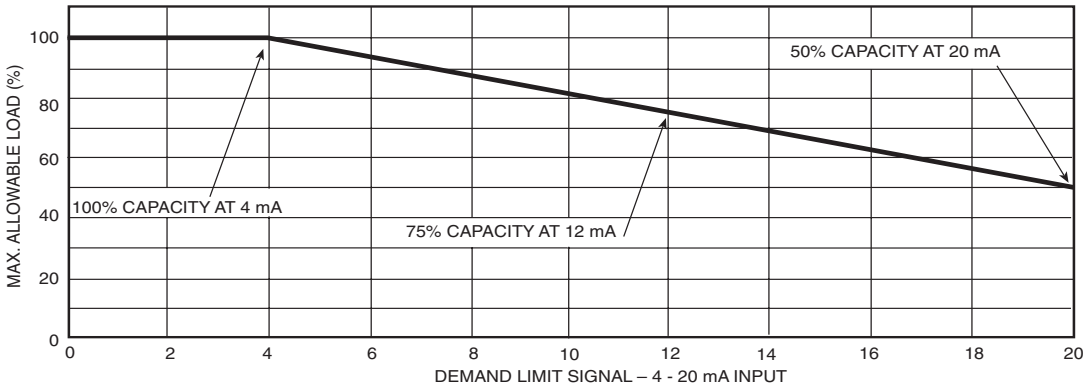



**Fig. 21A — 4- to 20-mA Demand Limiting**

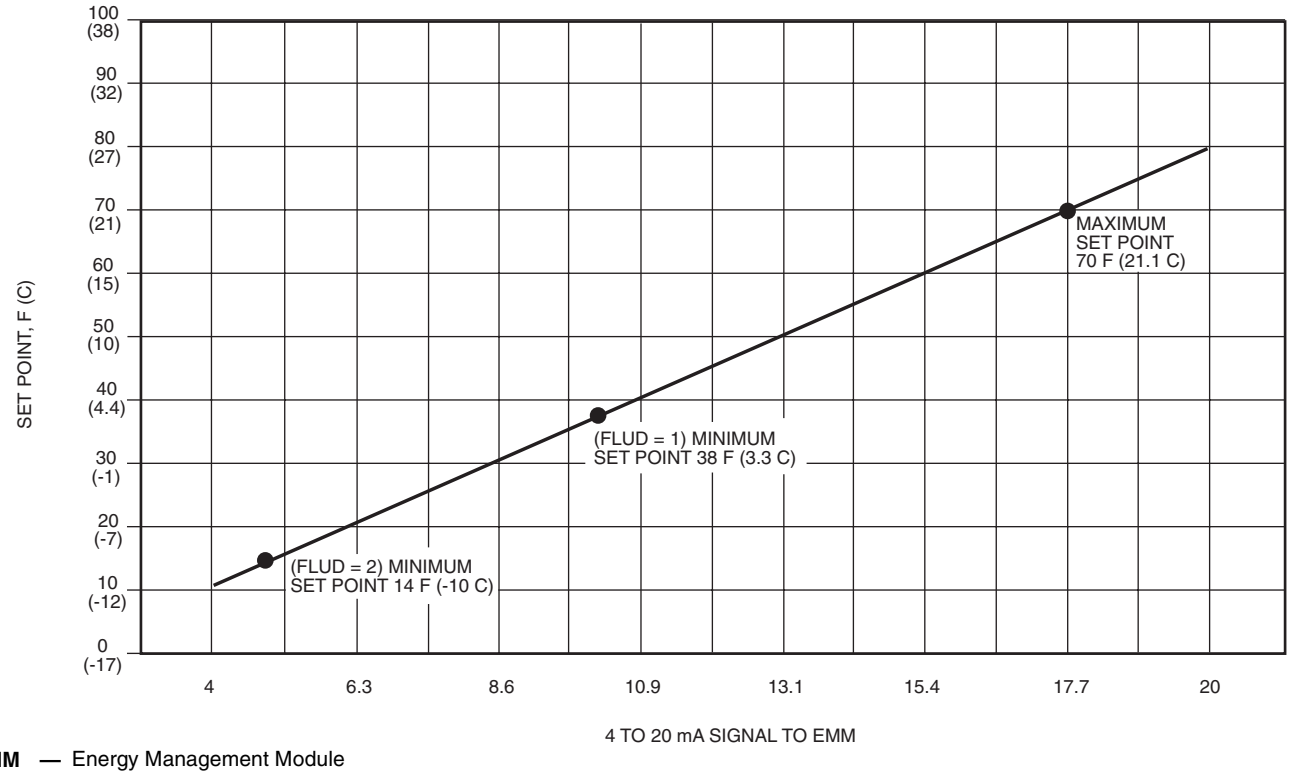
**⚠ CAUTION**

Care should be taken when interfacing with other manufacturer's control systems, due to possible power supply differences, full wave bridge versus half wave rectification. The two different power supplies cannot be mixed. *Comfort*Link™ controls use half wave rectification. A signal isolation device should be utilized if a full wave bridge signal generating device is used.

DEMAND LIMIT (SCN Loadshed Controlled) — To configure Demand Limit for SCN Loadshed control set the Demand Limit Select (DMDC) [Configuration, RSET] to 3. Then configure the Loadshed Group Number (SHNM), Loadshed Demand Delta (SHDL), and Maximum Loadshed Time (SHTM) [Configuration, RSET]. See Table 27.

The Loadshed Group number is established by the SCN system designer. The *Comfort*Link control will respond to a Redline command from the Loadshed control. When the Redline command is received, the current stage of capacity is set to the maximum stages available. Should the loadshed control send a Loadshed command, the *Comfort*Link control will reduce the current stages by the value entered for Loadshed Demand delta. The Maximum Loadshed Time is the maximum length of time that a loadshed condition is allowed to exist. The control will disable the Redline/Loadshed command if no Cancel command has been received within the configured maximum loadshed time limit.

**Cooling Set Point (4 to 20 mA) —** A field supplied and generated, externally powered 4 to 20 mA signal can be used to provide the leaving fluid temperature set point. Connect the signal to TB6-3,5 (+,–). See Table 27 for instructions to enable the function. Figure 21B shows how the 4 to 20 mA signal is linearly calculated on an overall 10 F to 80 F range for fluid types (FLUD) 1 or 2 [Configuration, OPT1]. The set point will be limited by the fluid (FLUD) type. Be sure that the chilled water loop is protected at the lowest temperature.




**EMM** — Energy Management Module

**Fig. 21B — Cooling Set Point (4 to 20 mA)**

**Table 27 — Configuring Demand Limit**

| MODE | KEYPAD ENTRY | SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT |
|---|---|---|---|---|---|---|---|
| CONFIGURATION | ENTER | DISP | ENTER | TEST | ON/OFF | Test Display LEDs | |
| | ▼ | UNIT | ENTER | TYPE | X | Unit Type | |
| | ▼ | OPT1 | ENTER | FLUD | X | Cooler Fluid | |
| | ▼ | OPT2 | ENTER | CTRL | X | Control Method | |
| | ▼ | RSET | ENTER | CRST | X | Cooling Reset Type | |
| | | | ▼ | DMDC* | X | Demand Limit Select | Default: 0<br>0 = None<br>1 = Switch<br>2 = 4 to 20 mA Input<br>3 = SCN Loadshed |
| | | | ▼ | DM20 | XXX % | Demand Limit at 20 mA | Default: 100%<br>Range: 0 to 100 |
| | | | ▼ | SHNM | XXX | Loadshed Group Number | Default: 0<br>Range: 0 to 99 |
| | | | ▼ | SHDL | XXX% | Loadshed Demand Delta | Default: 0%<br>Range: 0 to 60% |
| | | | ▼ | SHTM | XXX MIN | Maximum Loadshed Time | Default: 60 min.<br>Range: 0 to 120 min. |
| | | | ▼ | DLS1 | XXX % | Demand Limit Switch 1 | Default: 80%<br>Range: 0 to 100% |
| | | | ▼ | DLS2 | XXX % | Demand Limit Switch 2 | Default: 50%<br>Range: 0 to 100% |

*Seven items skipped in this example.

## TROUBLESHOOTING

**Complete Unit Stoppage and Restart —** Possible causes for unit stoppage and reset methods are shown below. (See Table 28 also.) Refer to Fig. 22-26 for Component Arrangement and Control Wiring Diagrams.

GENERAL POWER FAILURE — After power is restored, restart is automatic through normal MBB start-up.

UNIT ENABLE-OFF-REMOTE CONTACT SWITCH IS OFF — When the switch is OFF, the unit will stop immediately. Place the switch in the ENABLE position for local switch control or in the REMOTE CONTACT position for control through remote contact closure.

CHILLED FLUID PROOF-OF-FLOW SWITCH OPEN — After the problem causing the loss of flow has been corrected, reset is manual by resetting the alarm with the Scrolling Marquee as shown in Table 24.

OPEN HIGH-PRESSURE SWITCH(ES) — Determine and correct the cause of the failure. The switch automatically resets, but the unit must be reset manually by resetting the alarm with the Scrolling Marquee as shown in Table 24.

OPEN COMPRESSOR INTERNAL THERMAL PROTECTION — This switch provides compressor over temperature protection. Determine and correct the cause of the problem. The switch resets automatically, but the unit must be reset manually resetting the alarm with the Scrolling Marquee as shown in Table 24.

OPEN 24-V CONTROL CIRCUIT BREAKER(S) — Determine the cause of the failure and correct. Reset circuit breaker(s). Restart is automatic after MBB start-up cycle is complete.

COOLING LOAD SATISFIED — Unit shuts down when cooling load has been satisfied. Unit restarts when required to satisfy leaving fluid temperature set point.

THERMISTOR FAILURE — If a thermistor fails in either an open or shorted condition, the unit will be shut down. Replace T1, T2, or T9 as required. Unit restarts automatically, but must be reset manually by resetting the alarm with the Scrolling Marquee as shown in Table 24.

**⚠ CAUTION**

If unit stoppage occurs more than once as a result of any of the safety devices listed, determine and correct cause before attempting another restart.

LOW SATURATED SUCTION — Several conditions can lead to low saturated suction alarms and the chiller controls have several override modes built in which will attempt to keep the chiller from shutting down. Low fluid flow, low refrigerant charge and plugged filter driers are the main causes for this condition. To avoid permanent damage and potential freezing of the system, do NOT repeatedly reset these alert and/or alarm conditions without identifying and correcting the cause(s).

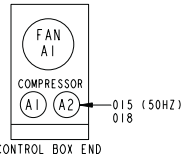
## Table 28 — Troubleshooting

| SYMPTOMS | CAUSE | REMEDY |
|---|---|---|
| **Cooler Circulating Pump Does Not Run** | Power line open | Reset circuit breaker. |
| | Control fuse or circuit breaker open | Check control circuit for ground or short. Reset breaker and replace fuse. |
| | Compressor over temperature sensor open (06D) | Find cause of high temperature and reset controls. |
| | Tripped power breaker | Check the controls. Find the cause of trip and reset breaker. |
| | Cooler circulating pump not running | Power off — restart. |
| | | Pump binding — free pump. |
| | | Incorrect wiring —rewire. |
| | | Pump motor burned out — replace. |
| | Loose terminal connection | Check connections. |
| | Improperly wired controls | Check wiring and rewire if necessary. |
| | Low line voltage | Check line voltage — determine location of voltage drop and remedy deficiency. |
| | Compressor motor defective | Check motor winding for open or short. Replace compressor if necessary. |
| | Seized compressor | Replace compressor. |
| **Compressor Cycles Off on Loss of Charge** | Loss of charge control erratic in action | Repair leak and recharge. |
| | | Replace control. |
| | Low refrigerant charge | Add refrigerant. |
| | Low suction temperature | Raise cooler leaving fluid temperature set point. |
| **Compressor Cycles Off on Out of Range Condition** | Thermistor failure | Replace thermistor. |
| | System load was reduced faster than controller could remove stages | Unit will restart after fluid temperature rises back into the control band. Avoid rapidly removing system load. |
| | Temperature controller deadband setting is too low | Raise deadband setting. |
| **Compressor Shuts Down on High-Pressure Control** | High-pressure control acting erratically | Replace control. |
| | Compressor discharge valve partially closed | Open valve or replace (if defective). |
| | Noncondensables in system | Purge system. |
| | Condenser scaled/dirty | Clean condenser. |
| | Condenser water pump or fans not operating | Start pump — repair or replace if defective. |
| | System overcharged with refrigerant | Reduce charge. |
| **Unit Operates Too Long or Continuously** | Low refrigerant charge | Add refrigerant. |
| | Control contacts fused | Replace control. |
| | Air in system | Purge system. |
| | Partially plugged or plugged expansion valve or filter drier | Clean or replace as needed. |
| | Defective insulation | Replace or repair as needed. |
| | Service load | Keep doors and windows closed. |
| | Inefficient compressor | Check valves, and replace if necessary. |
| **Unusual or Loud System Noises** | Piping vibration | Support piping as required. |
| | | Check for loose pipe connections |
| | Expansion valve hissing | Add refrigerant. |
| | | Check for plugged liquid line filter drier. |
| | Compressor noisy | Replace compressor (worn bearings). |
| | | Check for loose compressor holddown bolts. |
| **Compressor Loses Oil** | Leak in system | Repair leak. |
| | Mechanical damage (Failed seals or broken scrolls) | Replace compressor. |
| | Oil trapped in line | Check piping for oil traps. |
| **Hot Liquid Line** | Shortage of refrigerant due to leak | Repair leak and recharge. |
| **Frosted Liquid Line** | Shutoff valve partially closed or restricted | Open valve or remove restriction. |
| | Restricted filter drier | Replace filter drier. |
| **Frosted Suction Line** | Expansion valve admitting excess refrigerant (note: this is a normal condition for brine applications) | Adjust expansion valve. Replace valve if defective. |
| **Freeze-Up** | Improper charging | Make sure a full quantity of fluid is flowing through the cooler while charging, and suction pressure in cooler is equal to or greater than pressure corresponding to 32 F (0° C) (58 psig [400 kPa] for Refrigerant 22). |
| | System not drained for winter shutdown | *Recommended that system be filled with an appropriate glycol mixture to prevent freezing of pumps and fluid tubing.* |
| | Loose Thermistor | Verify thermistors are fully inserted in wells. |

LEGEND

| | | |
|---|---|---|
| **C** | — | Contactor, Compressor |
| **CB** | — | Circuit Breaker |
| **CHC** | — | Cooler/Pump Heater Contactor |
| **CWP** | — | Chilled Water Pump |
| **EMM** | — | Energy Management |
| **FC** | — | Fan Contactor |
| **FIOP** | — | Factory-Installed Option |
| **FU** | — | Fuse |
| **GND** | — | Ground |
| **MBB** | — | Main Base Board |
| **MM** | — | Motormaster® |
| **MMPT** | — | Motormaster Pressure Transducer |
| **MS** | — | Manual Starter |
| **NEC** | — | National Electrical Code |
| **SW** | — | Switch |
| **TB** | — | Terminal Block |
| **TRAN** | — | Transformer |
| ——— | | Factory Wiring |
| - - - - | | Field Wiring |
| —— - - —— | | Accessory or Option Wiring |

| LOW AMBIENT OPERATION (MOTORMASTER V) FIOP/ACCESSORY | | |
|---|---|---|
| UNIT VOLTAGE | CONFIGURATION JUMPER LOCATION | CONFIGURATION JUMPER COMMON LOCATION |
| 575-3-60 | 1 | 2 |
| 380-3-60 | 13A | |
| 230-3-60 | 1 | |
| 208-3-60 | 13A | |
| 460-3-60 | 1 | |
| 230-3-50 | 13B | |
| 380/415-3-50 | 13C | |




NOTES:
1. FACTORY WIRING IS IN ACCORDANCE WITH UL 1995 STANDARDS. ANY FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
2. USE 75°C MIN WIRE FOR FIELD POWER SUPPLY.
3. ALL COMPRESSOR MANUAL STARTERS "MUST TRIP AMPS" ARE EQUAL TO OR LESS THAN 156% RLA. ALL OTHER MANUAL STARTERS "MUST TRIP AMPS" ARE EQUAL TO OR LESS THAN 140% FLA.
4. ALL FIELD INTERLOCK CONTACTS MUST HAVE A MIN RATING OF 2 AMPS @ 24VAC SEALED. SEE FIELD INTERLOCK WIRING.
5. COMPRESSOR AND FAN MOTORS ARE THERMALLY PROTECTED--THREE PHASE MOTORS PROTECTED AGAINST PRIMARY SINGLE PHASE CONDITIONS.
6. INTERCHANGE FAN MOTOR CONNECTIONS 1 AND 3 TO ENSURE COUNTER CLOCKWISE FAN ROTATION.
7. TERMINALS 9 & 10 OF TB5 ARE FOR FIELD CONNECTION OF REMOTE ON-OFF. THE CONTACT MUST BE RATED FOR DRY CIRCUIT APPLICATION CAPABLE OF HANDLING A 5VDC 1 MA TO 20 MA LOAD.
8. COMPRESSORS ON MODELS 015 (50 HZ) AND 018 ARE PROTECTED BY INTERNAL LINE BREAK DEVICES NOT THERMOSTATS.
9. ALARM RELAY MUST BE INSTALLED FOR HEATING/BOILER RELAY OPERATION. DPST RELAY MUST BE USED FOR HEAT RELAY.
10. FOR 500 SERIES UNIT OPERATION AT 208-3-60V LINE VOLTAGE, TRAN1 PRIMARY CONNECTIONS MUST BE MOVED TO TERMINALS H3 & H4.

| FUSE NUMBER | UNIT VOLTAGE | TRANSFORMER SIZE | REPLACE WITH |
|---|---|---|---|
| FU1 & FU2 | 380-3-60,460-3-60,575-3-60 | 100VA | FNQ-R-3/4 |
| | 208/230-3-60,230-3-50,380/415-3-50 | | FNQ-R-2 |
| FU3 (24V) | 380-3-60,460-3-60,575-3-60 | 100VA | FNM-6 |
| | 208/230-3-60,230-3-50,380/415-3-50 | | |
| FU4 (115V) | 460-3-60,575-3-60 | 500VA | FNM-6 |
| | 208/230-3-60,230-3-60 | | |
| FU5 & FU6 | 460-3-60,575-3-60 | 500VA | FNQ-R-2 1/2 |
| | 208/230-3-60,230-3-60 | | FNQ-R-3 1/2 |

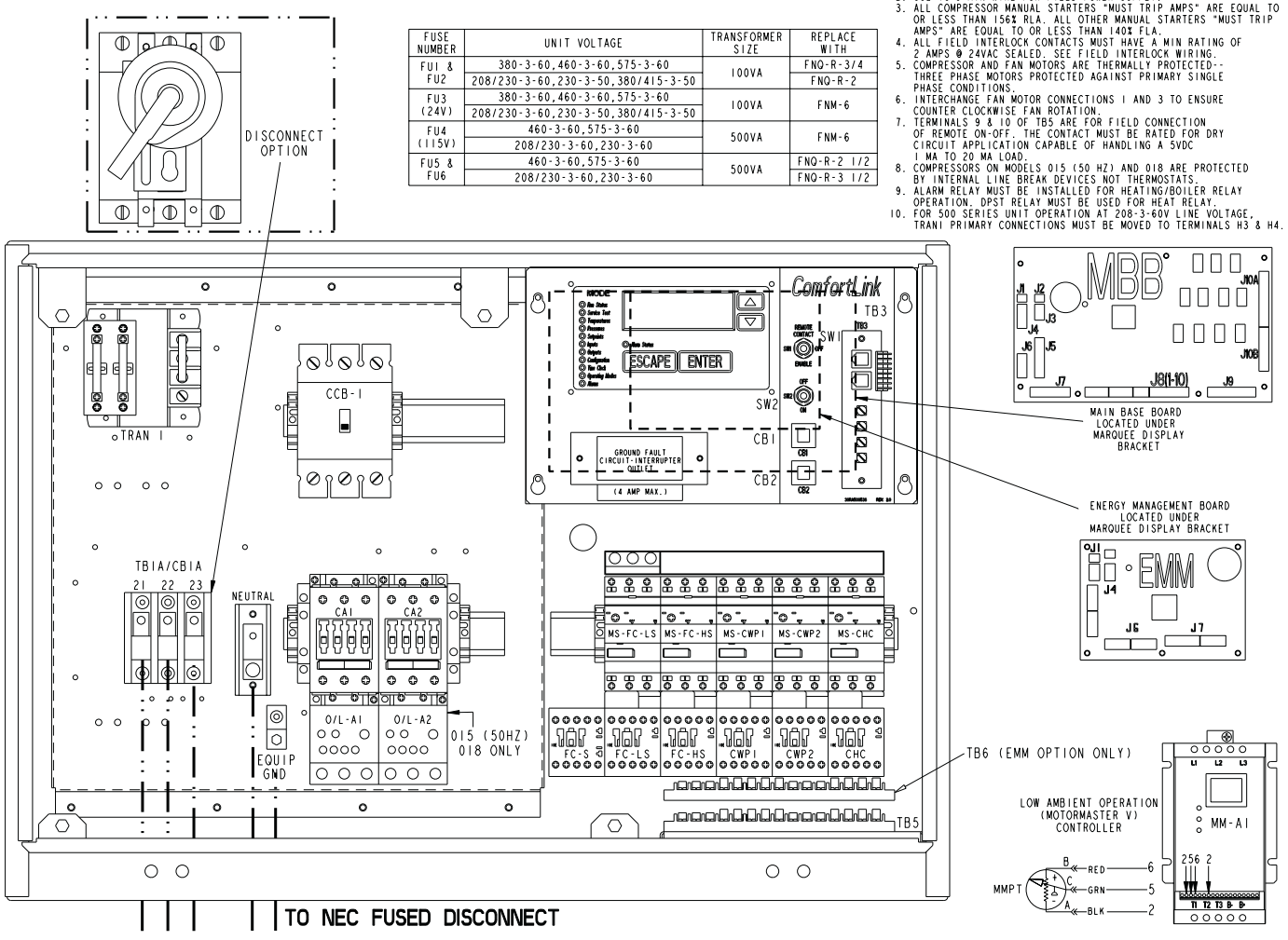
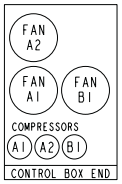


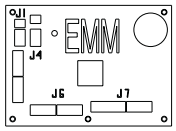

**Fig. 22 — Component Arrangement — 30RA010-030**

| LOW AMBIENT OPERATION (MOTORMASTER V) FIOP/ACCESSORY | | |
|---|---|---|
| UNIT VOLTAGE | CONFIGURATION JUMPER LOCATION | CONFIGURATION JUMPER COMMON LOCATION |
| 575-3-60 | 1 | 2 |
| 380-3-60 | 13A | |
| 230-3-60 | 1 | |
| 208-3-60 | 13A | |
| 460-3-60 | 1 | |
| 230-3-50 | 13B | |
| 380-3-50 | 13C | |
| 415-3-50 | 13C | |

LEGEND

| | | |
|---|---|---|
| **C** | — | Contactor, Compressor |
| **CB** | — | Circuit Breaker |
| **CHC** | — | Cooler/Pump Heater Contactor |
| **CWP** | — | Chilled Water Pump |
| **EMM** | — | Energy Management |
| **FC** | — | Fan Contactor |
| **FIOP** | — | Factory-Installed Option |
| **FU** | — | Fuse |
| **GND** | — | Ground |
| **MBB** | — | Main Base Board |
| **MM** | — | Motormaster® |
| **MMPT** | — | Motormaster Pressure Transducer |
| **MS** | — | Manual Starter |
| **NEC** | — | National Electrical Code |
| **SW** | — | Switch |
| **TB** | — | Terminal Block |
| **TRAN** | — | Transformer |
| ——— | | Factory Wiring |
| - - - - | | Field Wiring |
| ——- - - ——- | | Accessory or Option Wiring |

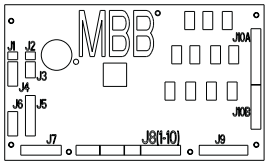



ENERGY MANAGEMENT BOARD
LOCATED UNDER
SCROLLING MARQUEE BRACKET

NOTES:
1. FACTORY WIRING IS IN ACCORDANCE WITH UL 1995 STANDARDS. ANY FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
2. USE 75°C MIN WIRE FOR FIELD POWER SUPPLY.
3. ALL COMPRESSOR MANUAL STARTERS "MUST TRIP AMPS" ARE EQUAL TO OR LESS THAN 156% RLA. ALL OTHER MANUAL STARTERS "MUST TRIP AMPS" ARE EQUAL TO OR LESS THAN 140% FLA.
4. ALL FIELD INTERLOCK CONTACTS MUST HAVE A MIN RATING OF 2 AMPS @ 24VAC SEALED. SEE FIELD INTERLOCK WIRING.
5. COMPRESSOR AND FAN MOTORS ARE THERMALLY PROTECTED--THREE PHASE MOTORS PROTECTED AGAINST PRIMARY SINGLE PHASE CONDITIONS.
6. INTERCHANGE FAN MOTOR CONNECTIONS 1 AND 3 TO ENSURE COUNTER CLOCKWISE FAN ROTATION.
7. TERMINALS 9 & 10 OF TB5 ARE FOR FIELD CONNECTION OF REMOTE ON-OFF. THE CONTACT MUST BE RATED FOR DRY CIRCUIT APPLICATION CAPABLE OF HANDLING A 5VDC 1 MA TO 20 MA LOAD.
8. ALARM RELAY MUST BE INSTALLED FOR HEATING/BOILER RELAY OPERATION. DPST RELAY MUST BE USED FOR HEAT RELAY.
9. FOR 500 SERIES UNIT OPERATION AT 208-3-60V LINE VOLTAGE, TRAN1 PRIMARY CONNECTIONS MUST BE MOVED TO TERMINALS H3 & H4.

| FUSE NUMBER | UNIT VOLTAGE | TRANSFORMER SIZE | REPLACE WITH |
|---|---|---|---|
| FU1 & FU2 | 380-3-60,460-3-60,575-3-60 | 200VA | FNQ-R-1 1/2 |
| | 208/230-3-60,230-3-50,380/415-3-50 | | FNQ-R-3 |
| FU3 (24V) | 380-3-60,460-3-60,575-3-60 | 200VA | FNM-10 |
| | 208/230-3-60,230-3-50,380/415-3-50 | | |
| FU4 (115V) | 460-3-60,575-3-60 | 500VA | FNM-6 |
| | 208/230-3-60,230-3-60 | | |
| FU5 & FU6 | 460-3-60,575-3-60 | 500VA | FNQ-R-2 1/2 |
| | 208/230-3-60,230-3-60 | | FNQ-R-3 1/2 |




MAIN BASE BOARD
LOCATED UNDER
SCROLLING MARQUEE
BRACKET

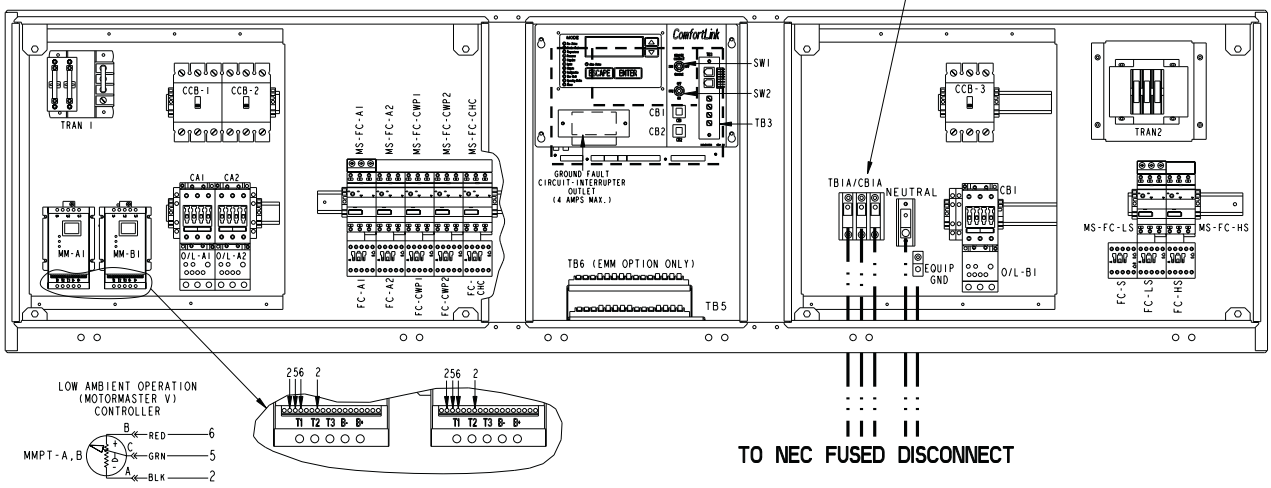
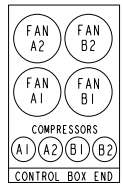


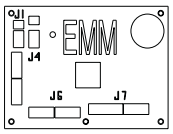

**Fig. 23 — Component Arrangement — 30RA032-040**

LEGEND

| | | |
|---|---|---|
| **C** | — | Contactor, Compressor |
| **CB** | — | Circuit Breaker |
| **CHC** | — | Cooler/Pump Heater Contactor |
| **CWP** | — | Chilled Water Pump |
| **EMM** | — | Energy Management |
| **FC** | — | Fan Contactor |
| **FIOP** | — | Factory-Installed Option |
| **FU** | — | Fuse |
| **GND** | — | Ground |
| **MBB** | — | Main Base Board |
| **MM** | — | Motormaster® |
| **MMPT** | — | Motormaster Pressure Transducer |
| **MS** | — | Manual Starter |
| **NEC** | — | National Electrical Code |
| **SW** | — | Switch |
| **TB** | — | Terminal Block |
| **TRAN** | — | Transformer |
| ——— | | Factory Wiring |
| - - - - | | Field Wiring |
| —— - —— | | Accessory or Option Wiring |

| LOW AMBIENT OPERATION (MOTORMASTER V) FIOP/ACCESSORY | | |
|---|---|---|
| UNIT VOLTAGE | CONFIGURATION JUMPER LOCATION | CONFIGURATION JUMPER COMMON LOCATION |
| 575-3-60 | 1 | 2 |
| 380-3-60 | 13A | |
| 230-3-60 | 1 | |
| 208-3-60 | 13A | |
| 460-3-60 | 1 | |
| 230-3-50 | 13B | |
| 380-3-50 | 13C | |
| 415-3-50 | 13C | |

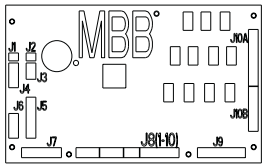


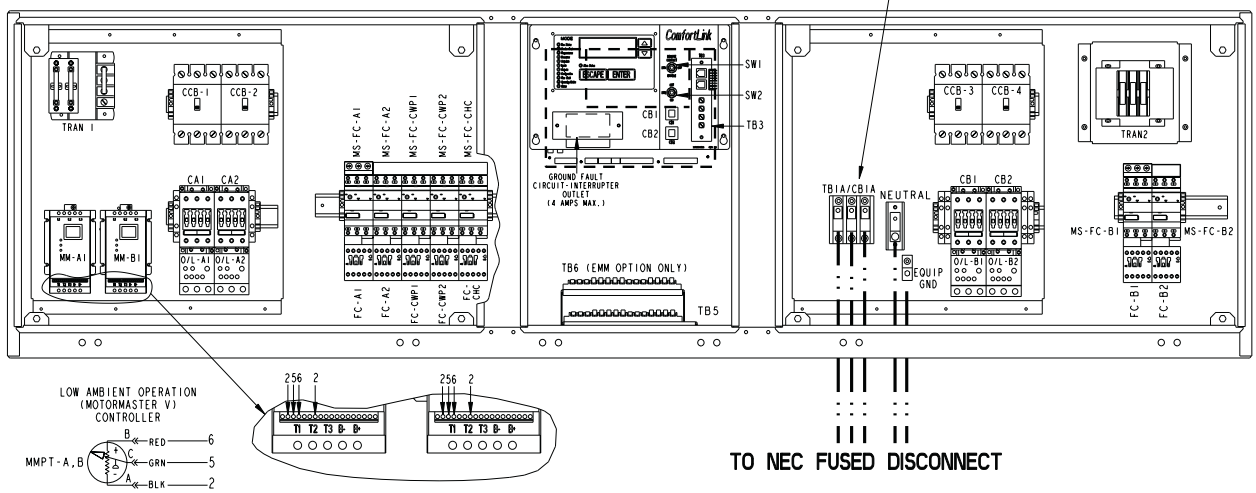

ENERGY MANAGEMENT BOARD LOCATED UNDER SCROLLING MARQUEE BRACKET

NOTES:
1. FACTORY WIRING IS IN ACCORDANCE WITH UL 1995 STANDARDS. ANY FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
2. USE 75°C MIN WIRE FOR FIELD POWER SUPPLY.
3. ALL COMPRESSOR MANUAL STARTERS "MUST TRIP AMPS" ARE EQUAL TO OR LESS THAN 156% RLA. ALL OTHER MANUAL STARTERS "MUST TRIP AMPS" ARE EQUAL TO OR LESS THAN 140% FLA.
4. ALL FIELD INTERLOCK CONTACTS MUST HAVE A MIN RATING OF 2 AMPS @ 24VAC SEALED. SEE FIELD INTERLOCK WIRING.
5. COMPRESSOR AND FAN MOTORS ARE THERMALLY PROTECTED-- THREE PHASE MOTORS PROTECTED AGAINST PRIMARY SINGLE PHASE CONDITIONS.
6. INTERCHANGE FAN MOTOR CONNECTIONS 1 AND 3 TO ENSURE COUNTER CLOCKWISE FAN ROTATION.
7. TERMINALS 9 & 10 OF TB5 ARE FOR FIELD CONNECTION OF REMOTE ON-OFF. THE CONTACT MUST BE RATED FOR DRY CIRCUIT APPLICATION CAPABLE OF HANDLING A 5VDC 1 MA TO 20 MA LOAD.
8. ALARM RELAY MUST BE INSTALLED FOR HEATING/BOILER RELAY OPERATION. DPST RELAY MUST BE USED FOR HEAT RELAY.
9. FOR 500 SERIES UNIT OPERATION AT 208-3-60V LINE VOLTAGE, TRAN1 PRIMARY CONNECTIONS MUST BE MOVED TO TERMINALS H3 & H4.

| FUSE NUMBER | UNIT VOLTAGE | TRANSFORMER SIZE | REPLACE WITH |
|---|---|---|---|
| FU1 & FU2 | 380-3-60,460-3-60,575-3-60 | 200VA | FNQ-R-1 1/2 |
| | 208/230-3-60,230-3-50,380/415-3-50 | | FNQ-R-3 |
| FU3 (24V) | 380-3-60,460-3-60,575-3-60 | 200VA | FNM-10 |
| | 208/230-3-60,230-3-50,380/415-3-50 | | |
| FU4 (115V) | 460-3-60,575-3-60 | 500VA | FNM-6 |
| | 208/230-3-60,230-3-60 | | |
| FU5 & FU6 | 460-3-60,575-3-60 | 500VA | FNQ-R-2 1/2 |
| | 208/230-3-60,230-3-60 | | FNQ-R-3 1/2 |




MAIN BASE BOARD LOCATED UNDER SCROLLING MARQUEE BRACKET







TO NEC FUSED DISCONNECT

**Fig. 24 — Component Arrangement — 30RA042-055**

NOTES:
1. Factory wiring is in accordance with UL 1995 standards. Field modifications or additions must be in compliance with all applicable codes.
2. Wiring for main field supply must be rated 75 C minimum. Use copper for all units. Maximum incoming wire size for the terminal block is #2/0 AWG. Maximum incoming wire size for 60 and 100 amp non-fused disconnect is #1 AWG. Maximum incoming wire size for 250 amp non-fused disconnect is 350 kcmil.
3. Terminals 9 and 10 of TB5 are for field external connections for remote on-off. The contacts must be rated for dry circuit application capable of handling a 24 vac load up to 50 mA.
4. Terminals 1 and 2 of TB5 are connected to the factory-installed chilled water flow switch (CWFS). To add chilled water pump interlock contacts, remove the orange harness wire from TB5-1 and wire contacts in series as shown. The contacts must be rated for dry circuit application capable of handling a 24 vac load up to 50 mA.
5. Terminals 11 and 13 of TB5 are for control of chilled water pump 1 (CWP1) starter. Terminals 13 and 15 of TB5 are for control of chilled water pump 2 (CWP2) starter. The maximum load allowed for the chilled water pump relay is 5 va sealed, 10 va inrush at 24 v. Field power supply is not required.
6. Terminals 12 and 13 of TB5 are for an alarm relay. The maximum load allowed for the alarm relay is 5 va sealed, 10 va inrush at 24 v. Field power supply is not required.
7. Make appropriate connections to TB6 as shown for energy management board options. The contacts for demand limit and ice done options must be rated for dry circuit application capable of handling a 24 vac load up to 50 mA.
8. Care should be taken when interfacing with other manufacturer's control systems due to possible power supply differences: full wave bridge versus half wave rectification. The two different power supplies cannot be mixed. *Comfort*Link™ controls use half wave rectification. A signal isolation device should be utilized if a full wave bridge signal generating device is used.

LEGEND

| | | |
|---|---|---|
| **A** | — | Alarm |
| **CWPI** | — | Chilled Water Pump Interlock |
| **CWP** | — | Chilled Water Pump |
| **EMM** | — | Energy Management |
| **FIOP** | — | Factory-Installed Option |
| **NEC** | — | National Electrical Code |
| **SPT** | — | Space Temperature |
| **TB** | — | Terminal Block |
| | | Field Power Wiring |
| | | Field Control Wiring |
| | | Factory-Installed Wiring |

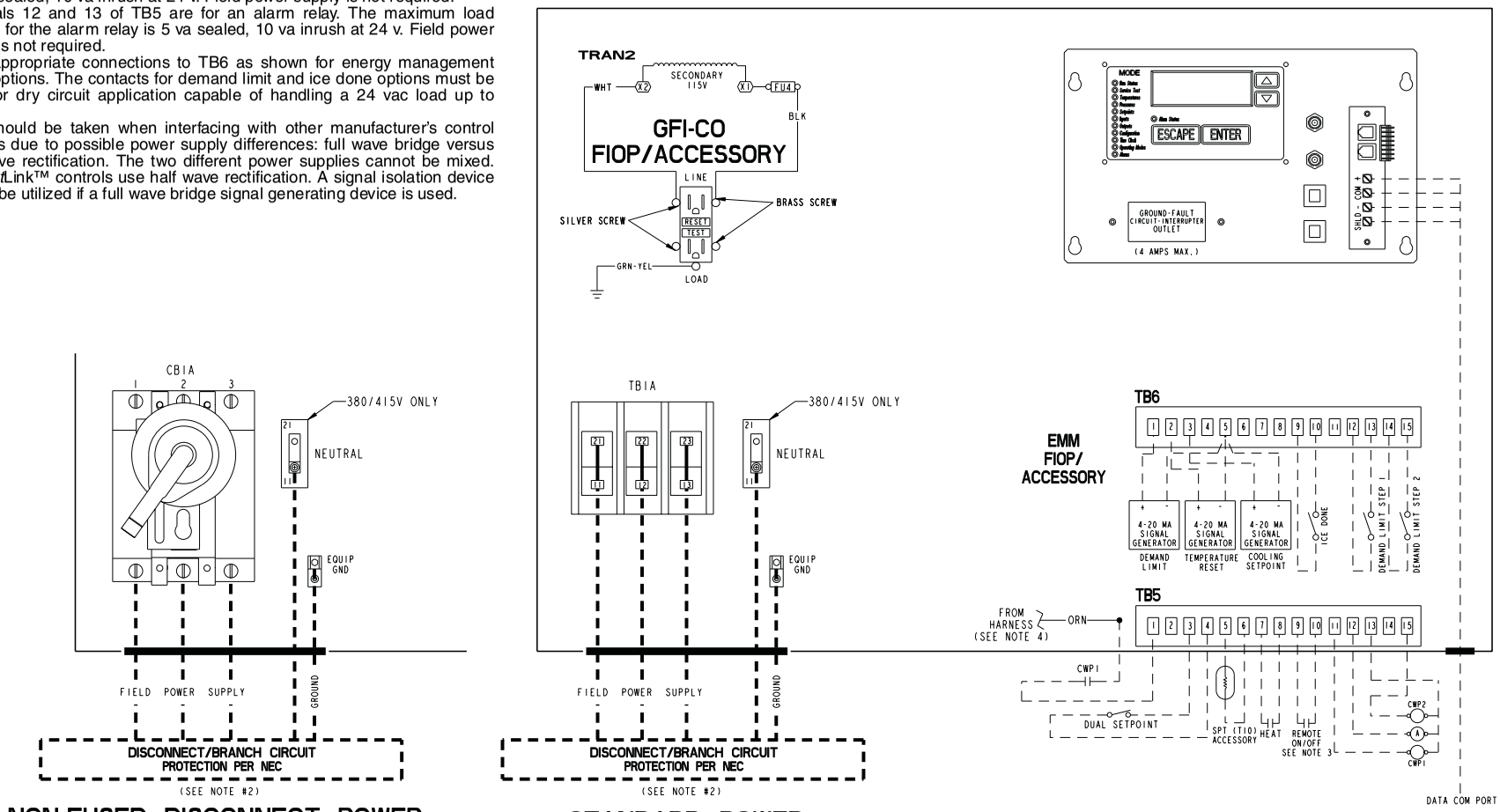
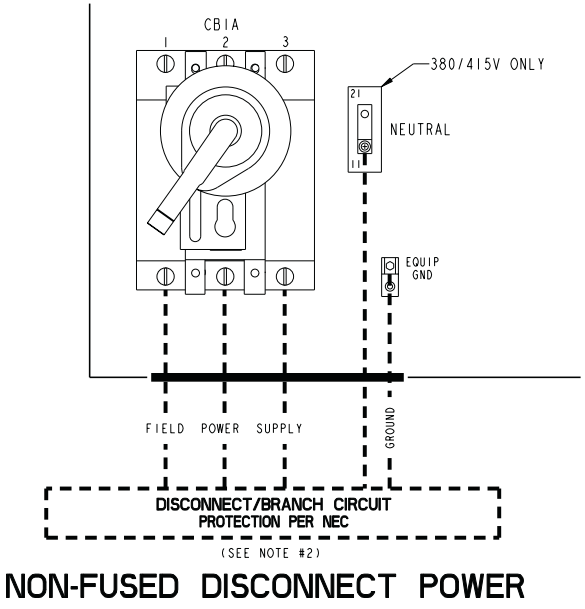



**Fig. 25 — Control and Field Power Wiring Diagram — 30RA010-030**

NOTES:
1. Factory wiring is in accordance with UL 1995 standards. Field modifications or additions must be in compliance with all applicable codes.
2. Wiring for main field supply must be rated 75 C minimum. Use copper for all units. Maximum incoming wire size for the terminal block is 350 kcmil. Maximum incoming wire size for 100 amp non-fused disconnect is #1 AWG. Maximum incoming wire size for 250 amp non-fused disconnect is 350 kcmil.
3. Terminals 9 and 10 of TB5 are for field external connections for remote on-off. The contacts must be rated for dry circuit application capable of handling a 24 vac load up to 50 mA.
4. Terminals 1 and 2 of TB5 are connected to the factory-installed chilled water flow switch (CWFS). To add chilled water pump interlock contacts, remove the orange harness wire from TB5-1 and wire contacts in series as shown. The contacts must be rated for dry circuit application capable of handling a 24 vac load up to 50 mA.
5. Terminals 11 and 13 of TB5 are for control of chilled water pump 1 (CWP1) starter. Terminals 13 and 15 of TB5 are for control of chilled water pump 2 (CWP2) starter. The maximum load allowed for the chilled water pump relay is 5 va sealed, 10 va inrush at 24 v. Field power supply is not required.
6. Terminals 12 and 13 of TB5 are for an alarm relay. The maximum load allowed for the alarm relay is 75 va sealed, 360 va inrush at 115 v. Field power supply is not required.
7. Make appropriate connections to TB6 as shown for energy management board options. The contacts for demand limit and ice done options must be rated for dry circuit application capable of handling a 24 vac load up to 50 mA.
8. Care should be taken when interfacing with other manufacturer's control systems due to possible power supply differences: full wave bridge versus half wave rectification. The two different power supplies cannot be mixed. *Comfort*Link™ controls use half wave rectification. A signal isolation device should be utilized if a full wave bridge signal generating device is used.



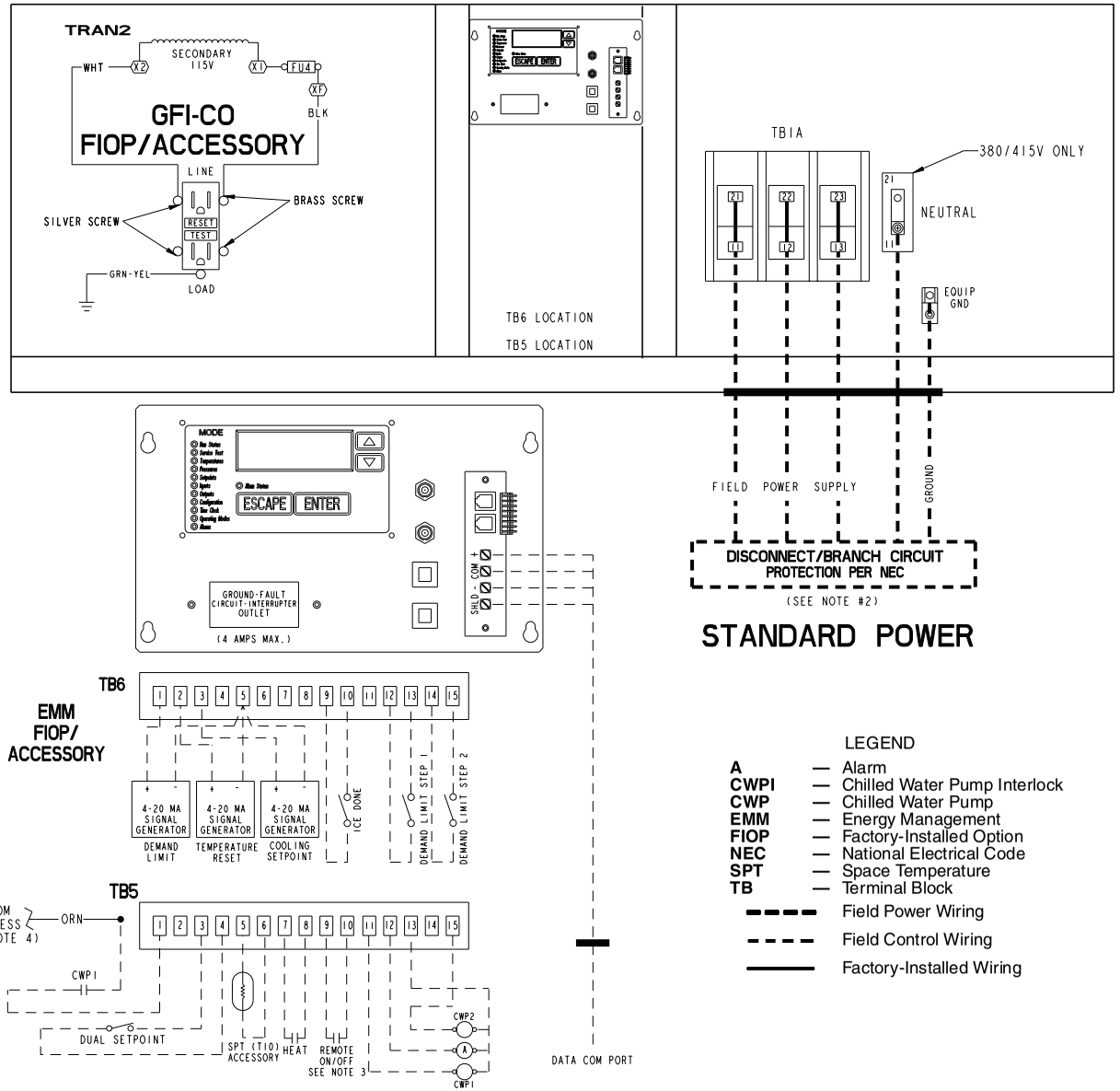




**Fig. 26 — Control and Field Power Wiring Diagram — 30RA032-055**

**Alarms and Alerts —** These are warnings of abnormal or fault conditions, and may cause either one circuit or the whole unit to shut down. They are assigned code numbers as described in Table 29.

Automatic alarms will reset without operator intervention if the condition corrects itself. The following method must be used to reset manual alarms:

Before resetting any alarm, first determine the cause of the alarm and correct it. Enter the Alarms mode indicated by the LED on the side of the Scrolling Marquee Display. Press ENTER and ▼ until the sub-menu item RCRN "RESET ALL CURRENT ALARMS" is displayed. Press ENTER. The control will prompt the user for a password, by displaying PASS and WORD. Press ENTER to display the default password, 1111. Press ENTER for each character. If the password has been changed, use the arrow keys to change each individual character. Toggle the display to "YES" and press ENTER. The alarms will be reset.

**Table 29 — Alarm and Alert Codes**

| ALARM/ ALERT CODE | ALARM OR ALERT | DESCRIPTION | WHY WAS THIS ALARM GENERATED? | ACTION TAKEN BY CONTROL | RESET METHOD | PROBABLE CAUSE |
|---|---|---|---|---|---|---|
| **T051** | Alert | Circuit A, Compressor 1 Failure | Compressor feedback signal does not match relay state | Compressor A1 shut down. | Manual | High-pressure switch open, faulty auxiliary contacts, loss of condenser air, liquid valve closed, filter drier plugged, non-condensables, operation beyond capability. |
| **T052** | Alert | Circuit A, Compressor 2 Failure | Compressor feedback signal does not match relay state | Compressor A2 shut down. | Manual | High-pressure switch open, faulty auxiliary contacts, loss of condenser air, liquid valve closed, filter drier plugged, non-condensables, operation beyond capability. |
| **T055** | Alert | Circuit B, Compressor 1 Failure | Compressor feedback signal does not match relay state | Compressor B1 shut down. | Manual | High-pressure switch open, faulty auxiliary contacts, loss of condenser air, liquid valve closed, filter drier plugged, non-condensables, operation beyond capability. |
| **T056** | Alert | Circuit B, Compressor 2 Failure | Compressor feedback signal does not match relay state | Compressor B2 shut down. | Manual | High-pressure switch open, faulty auxiliary contacts, loss of condenser air, liquid valve closed, filter drier plugged, non-condensables, operation beyond capability. |
| **A060** | Alarm | Cooler Leaving Fluid Thermistor Failure (T1) | Thermistor outside range of –40 to 245 F (–40 to 118 C) | Chiller shutdown immediately | Automatic | Thermistor failure, damaged cable/wire or wiring error. |
| **A061** | Alarm | Cooler Entering Fluid Thermistor Failure (T2) | Thermistor outside range of –40 to 245 F (–40 to 118 C) | Chiller shutdown immediately | Automatic | Thermistor failure, damaged cable/wire or wiring error. |
| **T068** | None | Circuit A Return Gas Thermistor Failure | If return gas sensors are enabled (RG.EN) and thermistor is outside range of –40 to 245 F (–40 to 118 C) | None | Automatic | Thermistor failure, damaged cable/wire or wiring error. |
| **T069** | None | Circuit B Return Gas Thermistor Failure | If return gas sensors are enabled (RG.EN) and thermistor is outside range of –40 to 245 F –40 to 118 C) | None | Automatic | Thermistor failure, damaged cable/wire or wiring error. |
| **T073** | Alert | Outside Air Thermistor Failure (T9) | Thermistor outside range of –40 to 245 F (–40 to 118 C) | Temperature reset disabled. Chiller runs under normal control/set points. When capacity reaches 0, cooler/pump heaters are energized. | Automatic | Thermistor failure, damaged cable/wire or wiring error. |
| **T074** | Alert | Space Temperature Thermistor Failure (T10) | Thermistor outside range of –40 to 245 F (–40 to 118 C) | Temperature reset disabled. Chiller runs under normal control/set points. | Automatic | Thermistor failure, damaged cable/wire or wiring error. |
| **T077** | Alert | Circuit A Saturated Suction Temperature exceeds Cooler Leaving Fluid Temperature | Faulty expansion valve, suction pressure transducer or leaving fluid thermistor (T1). | Circuit A shutdown after pumpdown complete. | Automatic | Faulty expansion valve or suction pressure transducer (T5) or leaving fluid thermistor (T1). |
| **T078** | Alert | Circuit B Saturated Suction Temperature exceeds Cooler Leaving Fluid Temperature | Faulty expansion valve, suction pressure transducer or leaving fluid thermistor (T1). | Circuit B shutdown after pumpdown complete | Automatic | Faulty expansion valve or suction pressure transducer (T6) or leaving fluid thermistor (T1). |
| **T079** | Alert | Lead/Lag LWT Thermistor Failure | Thermistor outside range of –40 to 245 F (–40 to 118 C) | Chiller runs as a stand alone machine | Automatic | Dual LWT thermistor failure, damaged cable/wire or wiring error. |
| **T090** | Alert | Circuit A Discharge Pressure Transducer Failure | Voltage ratio more than 99.9% or less than .5%. | Circuit A shut down | Automatic | Transducer failure, poor connection to MBB, or wiring damage/error. |
| **T091** | Alert | Circuit B Discharge Pressure Transducer Failure | Voltage ratio more than 99.9% or less than .5%. | Circuit B shut down | Automatic | Transducer failure, poor connection to MBB, or wiring damage/error. |
| **T092** | Alert | Circuit A Suction Pressure Transducer Failure | Voltage ratio more than 99.9% or less than .5%. | Circuit A shut down | Automatic | Transducer failure, poor connection to MBB, or wiring damage/error. |

## Table 29 — Alarm and Alert Codes (cont)

| ALARM/ ALERT CODE | ALARM OR ALERT | DESCRIPTION | WHY WAS THIS ALARM GENERATED? | ACTION TAKEN BY CONTROL | RESET METHOD | PROBABLE CAUSE |
|---|---|---|---|---|---|---|
| **T093** | Alert | Circuit B Suction Pressure Transducer Failure | Voltage ratio more than 99.9% or less than .5%. | Circuit B shut down | Automatic | Transducer failure, poor connection to MBB, or wiring damage/error. |
| **T110** | Alert | Circuit A Loss of Charge | If the compressors are off and discharge pressure reading is < 10 psig for 30 sec. | Circuit not allowed to start. | Manual | Refrigerant leak or transducer failure |
| **T111** | Alert | Circuit B Loss of Charge | If the compressors are off and discharge pressure reading is < 10 psig for 30 sec. | Circuit not allowed to start. | Manual | Refrigerant leak or transducer failure |
| **T112** | Alert | Circuit A High Saturated Suction Temperature | Circuit saturated suction temperature pressure transducer > 60 F (15.6 C) for 5 minutes | Circuit shut down | Manual | Faulty Expansion valve, faulty suction pressure transducer or high entering fluid temperature. |
| **T113** | Alert | Circuit B High Saturated Suction Temperature | Circuit saturated suction temperature pressure transducer > 60 F (15.6 C) for 5 minutes | Circuit shut down | Manual | Faulty Expansion valve, faulty suction pressure transducer or high entering fluid temperature. |
| **T114** | Alert | Circuit A Low Suction Superheat | Return gas sensor enabled and suction superheat is more than 10° F (5.6 C) below the suction superheat set point for 5 minutes. | Circuit A shut down after pumpdown complete. | Automatic restart after first daily occurrence. Manual restart thereafter. | Faulty expansion valve, faulty suction pressure transducer, faulty suction gas thermistor, circuit overcharged |
| **T115** | Alert | Circuit B Low Suction Superheat | Return gas sensor enabled and suction superheat is more than 10° F (5.6 C) below the suction superheat set point for 5 minutes. | Circuit B shut down after pumpdown complete. | Automatic restart after first daily occurrence. Manual restart thereafter. | Faulty expansion valve, faulty suction pressure transducer, faulty suction gas thermistor, circuit overcharged |
| **T116** | Alert | Circuit A Low Cooler Suction Temperature | Mode 7 caused the compressor to unload 6 consecutive times with less than a 30-minute interval between each circuit shutdown. | Circuit shut down | Manual | Faulty expansion valve, low refrigerant charge, plugged filter drier, faulty suction pressure transducer, low cooler fluid flow |
| **T117** | Alert | Circuit B Low Cooler Suction Temperature | Mode 8 caused the compressor to unload 6 consecutive times with less than a 30-minute interval between each circuit shutdown. | Circuit shut down | Manual | Faulty expansion valve, low refrigerant charge, plugged filter drier, faulty suction pressure transducer, low cooler fluid flow |
| **T126** | Alert | Circuit A High Discharge Pressure | SCT >Maximum condensing temperature from operating envelope | Circuit shut down | Automatic, only after first 3 daily occurrences. Manual reset thereafter. Reading from OAT sensor (T9) must drop 5 F (2.8 C) before restart | Faulty transducer/high pressure switch, low/ restricted condenser airflow |
| **T127** | Alert | Circuit B High Discharge Pressure | SCT >Maximum condensing temperature from operating envelope | Circuit shut down | Automatic, only after first 3 daily occurrences. Manual reset thereafter. Reading from OAT sensor (T9) must drop 5 F (2.8 C) before restart | Faulty transducer/high pressure switch, low/ restricted condenser airflow |
| **T133** | Alert | Circuit A Low Suction Pressure | Suction pressure below 15 psig for 8 seconds or below 8 psig | Circuit shut down | Automatic restart after first daily occurrence. Manual restart thereafter. | Faulty or plugged TXV, low refrigerant charge, TXV out of adjustment, liquid line valve partially closed |
| **T134** | Alert | Circuit B Low Suction Pressure | Suction pressure below 15 psig for 8 seconds or below 8 psig | Circuit shut down | Automatic restart after first daily occurrence. Manual restart thereafter. | Faulty or plugged TXV, low refrigerant charge, TXV out of adjustment, liquid line valve partially closed |

## Table 29 — Alarm and Alert Codes (cont)

| ALARM/ ALERT CODE | ALARM OR ALERT | DESCRIPTION | WHY WAS THIS ALARM GENERATED? | ACTION TAKEN BY CONTROL | RESET METHOD | PROBABLE CAUSE |
|---|---|---|---|---|---|---|
| **A140** | Alert | Reverse Rotation Detected | Incoming chiller power leads not phased correctly | Chiller not allowed to start. | Manual | Reverse any two incoming power leads to correct. Check for correct fan rotation first. |
| **A150** | Alarm | Emergency Stop | SCN emergency stop command received | Chiller shutdown without going through pumpdown. | Automatic once SCN command for EMSTOP returns to normal | SCN Network command. |
| **A151** | Alarm | Illegal Configuration | One or more illegal configurations exists. | Chiller is not allowed to start. | Manual once configuration errors are corrected | Configuration error. Check unit settings. |
| **A152** | Alarm | Unit Down Due to Failure | Both circuits are down due to alarms/alerts. | Chiller is unable to run. | Automatic once alarms/alerts are cleared that prevent the chiller from starting. | Alarm notifies user that chiller is 100% down. |
| **T153** | Alert | Real Time Clock Hardware Failure | Internal clock on MBB fails | Occupancy schedule will not be used. Chiller defaults to Local On mode. | Automatic when correct clock control restarts. | Time/Date/Month/ Day/Year not properly set. |
| **A154** | Alarm | Serial EEPROM Hardware Failure | Hardware failure with MBB | Chiller is unable to run. | Manual | Main Base Board failure. |
| **T155** | Alert | Serial EEPROM Storage Failure | Configuration/storage failure with MBB | No Action | Manual | Potential failure of MBB. Download current operating software. Replace MBB if error occurs again. |
| **A156** | Alarm | Critical Serial EEPROM Storage Failure | Configuration/storage failure with MBB | Chiller is not allowed to run. | Manual | Main Base Board failure. |
| **A157** | Alarm | A/D Hardware Failure | Hardware failure with peripheral device | Chiller is not allowed to run. | Manual | Main Base Board failure. |
| **A189** | Alarm | Cooler pump auxiliary contact inputs miswired | Pump 1 (2) aux contacts closed when pump 2 (1) energized. | Both pump outputs are turned off. | Manual | Wiring error, faulty pump contactor auxiliary contacts. |
| **T173** | Alert | Loss of Communication with EMM | MBB loses communication with EMM | 4 to 20 mA temperature reset disabled. Demand Limit set to 100%. 4 to 20 mA set point disabled. | Automatic | Wiring error, faulty wiring or failed Energy Manage-ment Module (EMM). |
| **T174** | Alert | 4 to 20 mA Cooling Set Point Input Failure | If configured with EMM and input less than 2 mA or greater than 22 mA | Set point function disabled. Chiller controls to CSP1. | Automatic | Faulty signal generator, wiring error, or faulty EMM. |
| **T176** | Alert | 4 to 20 mA Temperature Reset Input Failure | If configured with EMM and input less than 2 mA or greater than 22 mA | Reset function disabled. Chiller returns to normal set point control. | Automatic | Faulty signal generator, wiring error, or faulty EMM. |
| **T177** | Alert | 4 to 20 mA Demand Limit Input Failure | If configured with EMM and input less than 2 mA or greater than 22 mA | Demand limit function disabled. Chiller returns to 100% demand limit control. | Automatic | Faulty signal generator, wiring error, or faulty EMM. |
| **T189** | Alarm | Cooler pump 2 and Aux Contact Input miswired | Alarm is generated when the pump's aux contacts close when a pump is called for | Chiller not allowed to start | Manual | Wiring error |
| **T190** | Alert | Cooler pump 1 Aux Contacts Failed to Close at Start-Up | Pump 1 Auxiliary Contacts did not close within 26 seconds after pump was started | Pump 1 turned off. Pump 2 will be started if available. | Manual | Wiring error, faulty contacts on pump contactor |
| **T191** | Alert | Cooler pump 2 Aux Contacts Failed to Close at Start-Up | Pump 2 Auxiliary Contacts did not close within 26 seconds after pump was started | Pump 2 turned off. Pump 1 will be started if available. | Manual | Wiring error, faulty contacts on pump contactor |
| **T192** | Alert | Cooler pump 1 Failed to Provide Flow at Start-Up | Pump 1 did not provide flow to close flow switch within 60 seconds | Pump 1 turned off. Pump 2 will be started if available. | Manual | Wiring error, pump circuit breaker tripped, contactor failure |
| **T193** | Alert | Cooler pump 2 Failed to Provide Flow at Start-Up | Pump 2 did not provide flow to close flow switch within 60 seconds | Pump 1 turned off. Pump 2 will be started if available. | Manual | Wiring error, pump circuit breaker tripped, contactor failure |
| **T194** | Alert | Cooler pump 1 Aux Contacts Opened During Normal Operation | Pump 1 Auxiliary Contacts open for 26 seconds after initially made. All compressors shut down. Pump 1 turned off. | Pump 2 will be started if available. Chiller allowed to run if Pump 2 successfully starts. | Manual | Wiring error, faulty contacts on pump contactor |
| **T195** | Alert | Cooler pump 2 Aux Contacts Opened During Normal Operation | Pump 2 Auxiliary Contacts open for 26 seconds after initially made. All compressors shut down. Pump 2 turned off. | Pump 1 will be started if available. Chiller allowed to run if Pump 1 successfully starts. | Manual | Wiring error, faulty contacts on pump contactor |

## Table 29 — Alarm and Alert Codes (cont)

| ALARM/ ALERT CODE | ALARM OR ALERT | DESCRIPTION | WHY WAS THIS ALARM GENERATED? | ACTION TAKEN BY CONTROL | RESET METHOD | PROBABLE CAUSE |
|---|---|---|---|---|---|---|
| **T196** | Alert | Flow Lost While Pump 1 Running | Cooler flow switch contacts open for 3 seconds after initially made | All compressors shut down. Pump 1 turned off. Pump 2 will be started if available. Chiller allowed to run if Pump 2 successfully starts and flow switch is closed. | Manual | Wiring error, pump circuit breaker tripped, contactor failure |
| **T197** | Alert | Flow Lost While Pump 2 Running | Cooler flow switch contacts open for 3 seconds after initially made | All compressors shut down. Pump 2 turned off. Pump 1 will be started if available. Chiller allowed to run if Pump 1 successfully starts and flow switch is closed. | Manual | Wiring error, pump circuit breaker tripped, contactor failure |
| **T198** | Alert | Cooler pump 1 Aux Contacts Closed While Pump Off | Pump 1 Auxiliary Contacts closed for 26 seconds when pump state is off | Chiller not allowed to start | Automatic when aux contacts open | Wiring error, faulty pump contactor (welded contacts) |
| **T199** | Alert | Cooler pump 2 Aux Contacts Closed While Pump Off | Pump 2 Auxiliary Contacts closed for 26 seconds when pump state is off | Chiller not allowed to start | Automatic when aux contacts open | Wiring error, faulty pump contactor (welded contacts) |
| **T200** | Alert | Cooler Flow/Interlock Contacts failed to Close at start-up | Cooler flow switch contacts failed to close within 1 minute (if cooler pump control is enabled) or within 5 minutes (if cooler pump control is not enabled) after start-up | Chiller not allowed to start. For models with dual pumps, the second pump will be started if available | Manual | Wiring error, pump circuit breaker tripped, contactor failure, faulty flow switch or interlock |
| **A201** | Alarm | Cooler Flow/Interlock Contacts Opened During Normal Operation | Flow switch opens for at least 3 seconds after being initially closed | All compressors shut down. For models with dual pumps, the second pump will be started if available | Manual | Cooler pump failure, faulty flow switch or interlock, pump circuit breaker tripped |
| **A202** | Alarm | Cooler Pump Interlock Closed When Pump is Off | If configured for cooler pump control and flow switch input is closed for 5 minutes while pump output(s) are off | Chiller shut down | Automatic when aux contacts open | Wiring error, faulty pump contactor (welded contacts) |
| **T203** | Alert | Loss of Communication with slave chiller | Master chiller MBB loses communication with slave chiller MBB | Dual chiller control disabled. Chiller runs as a stand-alone machine. | Automatic | Wiring error, faulty wiring, failed Slave chiller MBB module, power loss at slave chiller, wrong slave address. |
| **T204** | Alert | Loss of Communication with master chiller | Slave chiller MBB loses communication with master chiller MBB | Dual chiller control disabled. Chiller runs as a stand-alone machine | Automatic | Wiring error, faulty wiring, failed master chiller MBB module, power loss at Master chiller. |
| **T205** | Alert | Master and slave chiller with same address | Master and slave chiller have the same SCN address (SCN.A) | Dual chiller routine disabled. Master/slave run as stand-alone chillers. | Automatic | SCN Address for both chillers is the same. Must be different. Check SCN.A under the OPT2 sub-mode in Configuration at both chillers. |
| **T206** | Alert | High Leaving Chilled Water Temperature | LWT read is greater than LCW Alert Limit, Total capacity is 100% and LWT is greater than LWT reading one minute ago | Alert only. No action taken. | Automatic | Building load greater than unit capacity, low water/brine flow or compressor fault. Check for other alarms/alerts. |
| **A207** | Alarm | Cooler Freeze Protection | Cooler EWT or LWT is less than Brine Freeze (BR.FZ) | Chiller shutdown without going through pumpdown. Cooler pump continues to run a minimum of 5 minutes (if control enabled). | Both EWT and LWT must be at least 6 F (3.3 C) above Brine Freeze point (BR.FZ). Automatic for first, Manual reset thereafter. | Faulty thermistor (T1/T2), low water flow. |
| **A208** | Alarm | EWT or LWT Thermistor failure | Cooler EWT is less than LWT by 3° F (1.7° C) for 1 minute after a circuit is started | Chiller shutdown. Cooler pump shut off (if control enabled). | Manual | Faulty cooler pump, low water flow, plugged fluid strainer. |
| **T300** | Alert | Cooler Pump 1 Scheduled Maintenance Due | Pump 1 Service Countdown (P.1.DN) expired. Complete pump 1 maintenance and enter 'YES' for Pump 1 Maintenance Done (P.1.MN) item. | None | Automatic | Routine pump maintenance required |

## Table 29 — Alarm and Alert Codes (cont)

| ALARM/ ALERT CODE | ALARM OR ALERT | DESCRIPTION | WHY WAS THIS ALARM GENERATED? | ACTION TAKEN BY CONTROL | RESET METHOD | PROBABLE CAUSE |
|---|---|---|---|---|---|---|
| **T301** | Alert | Cooler Pump 2 Scheduled Maintenance Due | Pump 2 Service Countdown (P.2.DN) expired. Complete pump 2 maintenance and enter 'YES' for Pump 1 Maintenance Done (P.2.MN) item. | None | Automatic | Routine pump maintenance required |
| **T302** | Alert | Strainer Blowdown Scheduled Maintenance Due | Strainer Service Countdown (S.T.DN) expired. Complete strainer blowdown and enter 'YES' for Strainer Maintenance Done (S.T.MN) item. | None | Automatic | Routine strainer maintenance required |
| **T303** | Alert | Condenser Coil Maintenance Due | Coil Service Countdown (C.L.DN) expired. Complete condenser coil cleaning and enter 'YES' for Coil Maintenance Done (C.L.MN) item. | None | Automatic | Routine condenser coil maintenance required |
| **T950** | Alert | Loss of Communication with Water System Manager | No communications have been received by the MBB within 5 minutes of last transmission | WSM forces removed. Chiller runs under own control | Automatic | Failed module, wiring error, failed transformer, loose connection plug, wrong address |
| **T951** | Alert | Loss of Communication with Flotronic™ System Manager | No communications have been received by the MBB within 5 minutes of last transmission | FSM forces removed. Chiller runs under own control | Automatic | Failed module, wiring error, failed transformer, loose connection plug, wrong address |
| **T952** | Alert | Loss of Communication with Hydronic System Manager | No communications have been received by the MBB within 5 minutes of last transmission | HSM forces removed. Chiller runs under own control | Automatic | Failed module, wiring error, failed transformer, loose connection plug, wrong address |

LEGEND

**SCN** — **Sterlco** Comfort Network
**EMM** — Energy Management Module
**EWT** — Entering Fluid Temperature
**FSM** — Flotronic™ System Manager
**HSM** — Hydronic System Manager
**LCW** — Leaving Chilled Water
**LWT** — Leaving Fluid Temperature
**MBB** — Main Base Board
**OAT** — Outdoor-Air Temperature
**SCT** — Saturated Condensing Temperature
**TXV** — Thermostatic Expansion Valve
**WSM** — Water System Manager

ELECTRIC SHOCK HAZARD.

Turn off all power to unit before servicing. The ENABLE/OFF/REMOTE CONTACT switch on control panel does *not* shut off control power; *use field disconnect.*

## Electronic Components

CONTROL COMPONENTS — Unit uses an advanced electronic control system that normally does not require service. For details on controls refer to Operating Data section.

Access to the compressors is through latched panels from beneath the control box on all models or from opposite the coil side (sizes 010-030 only). The front door(s) provide access to the compressor(s) and all components of the refrigeration system. For size 010-030 units, access to the controls is through the upper latched outer door above the compressor access door. Similarly, the upper center latched door on sizes 032-055 gives access to the controls. Inner panels are secured in place and should not be removed unless all power to the chiller is off.

**Compressor Replacement (Refer to Fig. 27-30) —** All models contain scroll compressors and have from one to four compressors. The size 010-030 units are a single refrigeration circuit while sizes 032-055 are dual circuit. A compressor is most easily removed from the front of the unit, depending on where clearance space was allowed during unit installation.

Unscrew the junction box cover bolts and disconnect the compressor power and ground connections. Remove the cable from the compressor junction box. Remove the connections from the internal thermostat and high-pressure switch (all compressors except SM110) or high-pressure switch connections (SM110 only). Knock the same holes out of the new compressor junction box and install the cable connectors from the old compressor. Remove the blockoff channel from below the control box.

Be sure the oil equalization line fitting is removed from the old compressor and installed on the new compressor for those models with dual compressor circuits. The compressors are bolted to the unit basepan. Remove the 4 bolts holding the compressor to the basepan. Save the mounting hardware for use with the new compressor. Carefully cut the compressor suction and discharge lines with a tubing cutter as close to the compressor as feasible. For dual compressor circuits, do NOT disturb the suction line tee at the backside of the compressors. This tee contains a special tube that is required for proper oil return. Remove high-pressure switch and pressure transducer(s) if required for compressor removal. Lift one corner of the compressor at a time and remove all the rubber mounting grommets. Remove the old compressor from the unit.

Slide the new compressor in place on the basepan. Lifting one side of the compressor at a time, replace all of the compressor mounting grommets. Using new tubing or couplings as required, reconnect compressor suction and discharge lines. Using hardware saved, reinstall the mounting bolts and washers through the compressor feet. Using proper techniques, braze suction and discharge lines and check for leaks. Reconnect oil equalization line on dual compressor circuit models.

Reconnect the compressor power connections and high-pressure switch/internal thermostat wiring as on the old compressor. Refer to Fig. 27-30. Following the installation of the new compressor, tighten all hardware to the following specifications. (See Table 30.)

**Table 30 — Unit Torque Specification**

| FASTENER | RECOMMENDED TORQUE |
|---|---|
| **Compressor Mounting Bolts** | 10 to 14 ft-lb (13.5 to 18.9 N-m) |
| **Compressor Power Connections** | 24 to 28 in.-lb (2.7- to 3.2 N-m) |
| **Compressor Ground Terminal Connections** | 14 to 18 in.-lb (1.6 to 2.0 N-m) |
| **Oil Equalization Line Fitting** | 10 to 13 ft-lb (13.5 to 17.6 N-m) |

## Cooler

BRAZED-PLATE COOLER HEAT EXCHANGER REPLACEMENT — Brazed-plate heat exchangers cannot be repaired if they develop a leak. If a leak (refrigerant or water) develops, the heat exchanger **must be** replaced. To replace a brazed plate heat exchanger:

1. Disconnect the liquid-in and liquid-out connections at the heat exchanger.
2. Check that the replacement heat exchanger is the same as the original heat exchanger. The unit insulation covers the manufacturer's part number. Make sure the depths of the replacement and original cooler heat exchangers are the same.
3. Reclaim the refrigerant from the system, and unsolder the refrigerant-in and refrigerant-out connections.
4. Remove the old heat exchanger and the bracket that it is mounted to. The replacement heat exchanger is supplied attached to a new mounting bracket and is fully insulated. It also includes a cooler heater. Use of the heater is not required unless the original cooler contained a factory installed heater.
5. Install the replacement heat exchanger in the unit and attach the mounting bracket hardware to the fan uprights (sizes 010-030) or to the bottom bracket (sizes 032-055) using the hardware removed in Step 4. Reconnect the cooler heater if required.
6. *Carefully* braze the refrigerant lines to the connections on the heat exchanger. Lines should be soldered using silver as the soldering material with a minimum of 45% silver. Keep the temperature below 1472 F (800 C) under normal soldering conditions (no vacuum) to prevent the copper solder of the brazed plate heat exchanger from changing its structure. Failure to do so can result in internal or external leakage at the connections which cannot be repaired.
7. Reconnect the water/brine lines.
8. Dehydrate and recharge the unit. Check for leaks.

BRAZED-PLATE COOLER HEAT EXCHANGER CLEANING — Brazed-plate heat exchangers must be cleaned chemically. A professional cleaning service skilled in chemical cleaning should be used. Use a weak acid (5% phosphoric acid, or if the heat exchanger is cleaned frequently, 5% oxalic acid). Pump the cleaning solution through the exchanger, preferably in a backflush mode. After cleaning, rinse with large amounts of fresh water to dispose of all the acid. Cleaning materials must be disposed of properly.

The factory-installed strainer screen in front of the water/brine inlets of the heat exchangers should be cleaned periodically, depending on condition of the chiller water/brine.

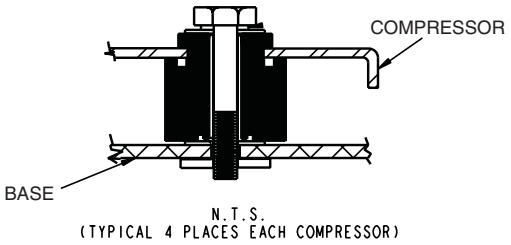
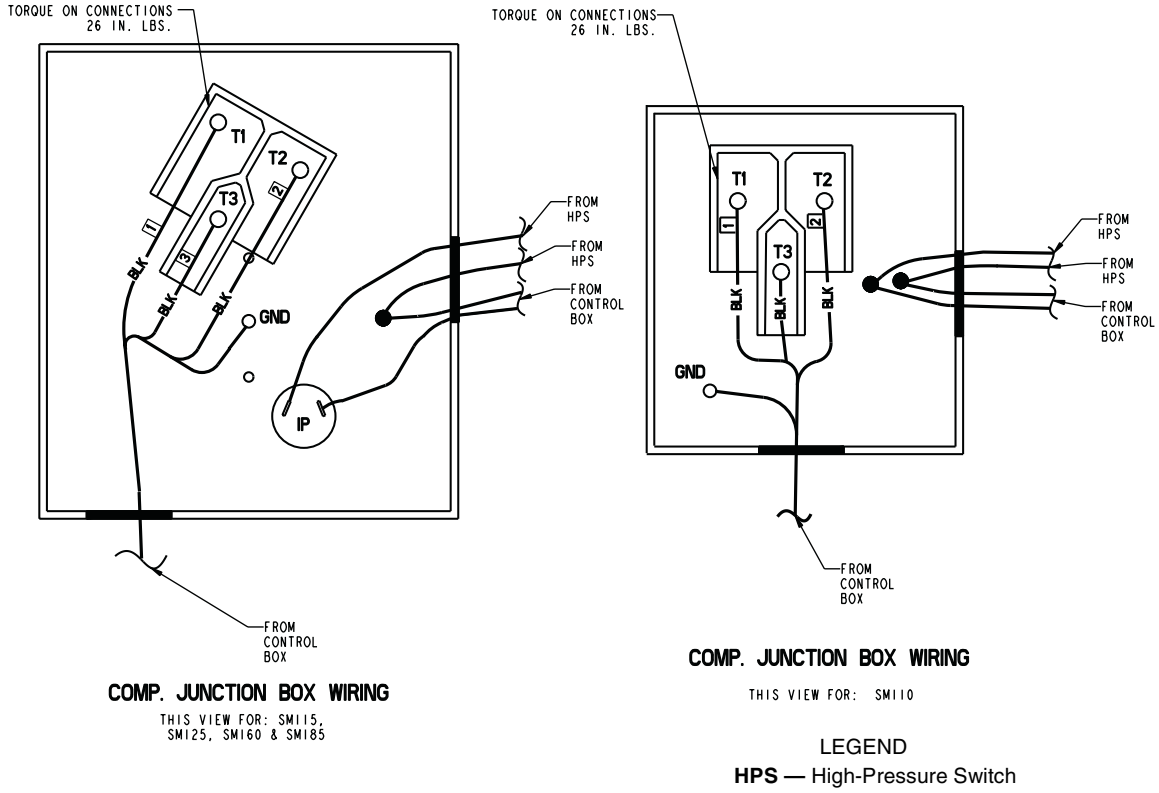



**Fig. 27 — Typical Compressor Mounting — All Sizes**




LEGEND
**HPS —** High-Pressure Switch

**Fig. 28 — Compressor Wiring**

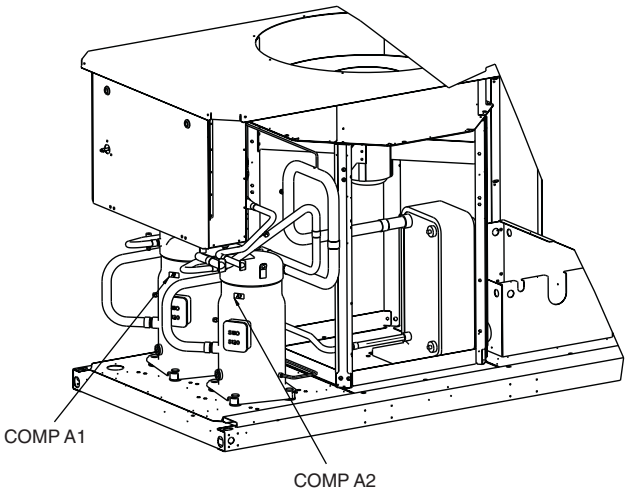



**Fig. 29 — Compressor Location — 30RA010-030**

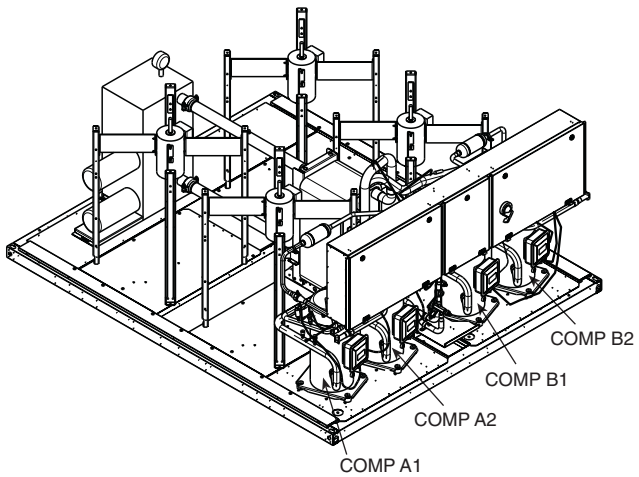



**Fig. 30 — Compressor Location — 30RA032-055**

**Check Oil Charge —** Compressors are factory charged with oil as shown in Table 31.

**Table 31 — Oil Charge**

| COMPRESSOR | AMOUNT pints (liters) |
|---|---|
| SM110 | 5.7 (2.7) |
| SM115, SM125 | 6.7 (3.2) |
| SM160 | 7.0 (3.3) |
| SM185 | 11.6 (5.5) |

If oil is visible in the compressor sight glass, check unit for operating readiness as described in Pre-Start-Up, System Check section (page 74), then start the unit. Observe oil level and add oil if required, to bring oil level in compressor crankcase up to between $^1/_4$ and $^3/_4$ of sight glass during steady operation.

To Add Oil:

1. Check the oil level with all compressors in the circuit running in a stabilized condition or immediately after compressor shutdown. The oil level should be at $^1/_3$ of the oil sight glass immediately after shutdown.
2. Using a suitable pump, add oil while compressor(s) are running through the low side ¼ in. Schraeder fitting on the compressor. For SM110 models, this fitting is directly above the suction line connection. For all other compressor models, this fitting is near the oil equalization line fitting at the same height as the suction line connection.
3. Run all compressors on the circuit for at least 15 minutes and check the oil level.

Use only Sterling-approved compressor oil:

Totaline ..... PP680002
Penreco .....Sontex 160 LT-A

Do not reuse drained oil, and do not use any oil that has been exposed to the atmosphere.

## Condenser Section and Coils

COIL CLEANING — For standard aluminum, copper and pre-coated aluminum fin coils, clean the coils with a vacuum cleaner, fresh water, compressed air, or a bristle brush (not wire). Units installed in corrosive environments should have coil cleaning as part of a planned maintenance schedule. In this type of application, all accumulations of dirt should be cleaned off the coil. When condenser cleaning is complete, enter "Yes" for coil cleaning maintenance done (CL.MN) value under Run Status.

**⚠ CAUTION**

Do not use high-pressure water or air to clean coils — fin damage may result.

CLEANING E-COATED COILS — Follow the outlined procedure below for proper care, cleaning and maintenance of E-coated aluminum or copper fin coils:

Coil Maintenance and Cleaning Recommendations — Routine cleaning of coil surfaces is essential to maintain proper operation of the unit. Elimination of contamination and removal of harmful residues will greatly increase the life of the coil and extend the life of the unit.

Remove Surface Loaded Fibers — Surface loaded fibers or dirt should be removed with a vacuum cleaner. If a vacuum cleaner is not available, a soft brush may be used. In either case, the tool should be applied in the direction of the fins. Coil surfaces can be easily damaged (fin edges bent over) if the tool is applied across the fins.

NOTE: Use of a water stream, such as a garden hose, against a surface loaded coil will drive the fibers and dirt into the coil. This will make cleaning efforts more difficult. Surface loaded fibers must be completely removed prior to using low velocity clean water rinse.

Periodic Clean Water Rinse — A periodic clean water rinse is very beneficial for coils that are applied in coastal or industrial environments. However, it is very important that the water rinse is made with very low velocity water stream to avoid damaging the fin edges. Monthly cleaning as described below is recommended.

Routine Cleaning of Coil Surfaces — Monthly cleaning with Environmentally Sound Coil Cleaner is essential to extend the life of coils. It is recommended that all coils, including standard aluminum, pre-coated, copper/copper or E-coated coils are cleaned with the Environmentally Sound Coil Cleaner as described below. Coil cleaning should be part of the units regularly scheduled maintenance procedures to ensure long life of the coil. Failure to clean the coils may result in reduced durability in the environment.

Environmentally Sound Coil Cleaner is non-flammable, hypo allergenic, non-bacterial, USDA accepted biodegradable and 100% ecologically safe agent that will not harm the coil or surrounding components such as electrical wiring, painted metal surfaces or insulation. Use of non-recommended coil cleaners is strongly discouraged since coil and unit durability could be affected.

Environmentally Sound Coil Cleaner Application Equipment

- $2^1/_2$ Gallon Garden Sprayer
- Water Rinse with Low Velocity Spray Nozzle

Environmentally Sound Coil Cleaner Application Instructions

- Although Environmentally Sound Coil Cleaner is harmless to humans, animals, and marine life, proper eye protection such as safety glasses is recommended during mixing and application.
- Remove all surface loaded fibers and dirt with a vacuum cleaner as described above.
- Thoroughly wet finned surfaces with clean water and a low velocity garden hose being careful not to bend fins.
- Mix Environmentally Sound Coil Cleaner in a $2^1/_2$ gallon garden sprayer according to the instructions included with the Enzyme Cleaner. The optimum solution temperature is 100 F.

**NOTE: DO NOT USE water in excess of 130 F as the enzymatic activity will be destroyed.**

- Thoroughly apply Environmentally Sound Coil Cleaner solution to all coil surfaces including finned area, tube sheets and coil headers.
- Hold garden sprayer nozzle close to finned areas and apply cleaner with a vertical, up-and-down motion. Avoid spraying in horizontal pattern to minimize potential for fin damage.
- Ensure cleaner thoroughly penetrates deep into finned areas.
- Interior and exterior finned areas must be thoroughly cleaned.
- Finned surfaces should remain wet with cleaning solution for 10 minutes.
- Ensure surfaces are not allowed to dry before rinsing. Reapply cleaner as needed to ensure 10-minute saturation is achieved.

- Thoroughly rinse all surfaces with low velocity clean water using downward rinsing motion of water spray nozzle. Protect fins from damage from the spray nozzle.

**⚠ CAUTION**

Harsh Chemical and Acid Cleaners — Harsh chemical, household bleach or acid cleaners should not be used to clean outdoor or indoors coils of any kind. These cleaners can be very difficult to rinse out of the coil and can accelerate corrosion at the fin/tube interface where dissimilar materials are in contact. If there is dirt below the surface of the coil, use the Environmentally Sound Coil Cleaner as described above.

High Velocity Water or Compressed Air — High velocity water from a pressure washer, garden hose or compressed air should never be used to clean a coil. The force of the water or air jet will bend the fin edges and increase airside pressure drop. Reduced unit performance or nuisance unit shutdown may occur.

CONDENSER SECTION — Condenser fan motors and fans can be serviced by removal of outlet grilles or side panels. See Fig. 31. Be sure the wire fan guard is in place over each fan before starting unit. See Fig. 32 and 33 for proper fan adjustment. Fan mounting system is designed for fan to drop all the way on the motor shaft to be correctly located in the orifice. Tighten fan hub securely on motor shaft with setscrews which bear against the key. Be sure to replace the plastic fan cap and secure in place with the four locking clips to keep water and debris out of shaft area.

## Check Refrigerant Feed Components

THERMOSTATIC EXPANSION VALVE (TXV) — The TXV controls the flow of liquid refrigerant to the cooler by maintaining constant superheat of vapor leaving the cooler. There is one valve per refrigerant circuit. The valve(s) is activated by a temperature-sensing bulb(s) strapped to the suction line(s). For proper TXV sensing bulb location, see Fig. 34.

The valve is factory-set to maintain between 8 and 12 F (4.4 and 6.7 C) of superheat entering the compressor(s). Elevate head pressure to 280 psig (1930 kPa) by blocking the airflow through the condenser. Check the superheat during operation after conditions have stabilized. A factory-installed temperature well is in each suction line for this purpose. If necessary, adjust the superheat to prevent refrigerant floodback to the compressor. Adjust TXVs $^1/_2$ turn at a time, allowing the circuit to stabilize between adjustments. Turn stem counterclockwise to decrease superheat and clockwise to increase superheat.

FILTER DRIER — The function of the filter drier is to maintain a clean, dry system. The moisture indicator (described below) indicates any need to change the filter drier. The filter drier is a sealed-type drier. When the drier needs to be changed, the entire filter drier must be replaced.

NOTE: Dual circuit (032-055 sizes) units have 1 filter drier per circuit.

MOISTURE-LIQUID INDICATOR — The indicator is located immediately ahead of the TXV to provide an indication of the refrigerant moisture content. It also provides a sight glass for refrigerant liquid. Clear flow of liquid refrigerant (*at full unit loading*) indicates sufficient charge in the system. Bubbles in the sight glass (*at full unit loading*) indicate an undercharged system or the presence of noncondensables. Moisture in the system, measured in parts per million (ppm), changes the color of the indicator as follows:

Green (safe) —Moisture is below 45 ppm
Yellow-Green (caution) — 45 to 130 ppm
Yellow (wet) — above 130 ppm

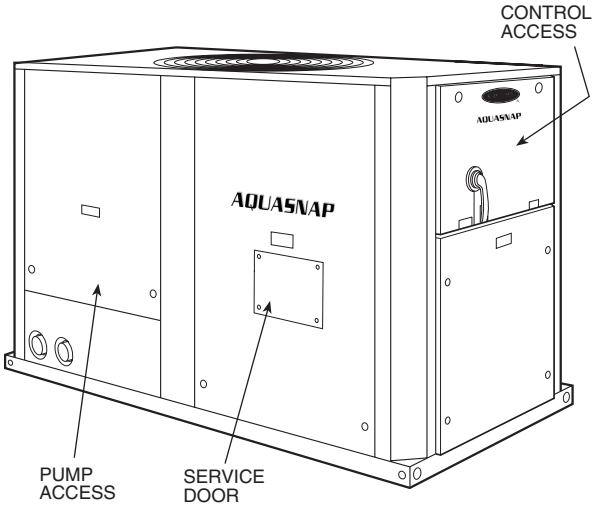



**Fig. 31 — 30RA Access Panels**

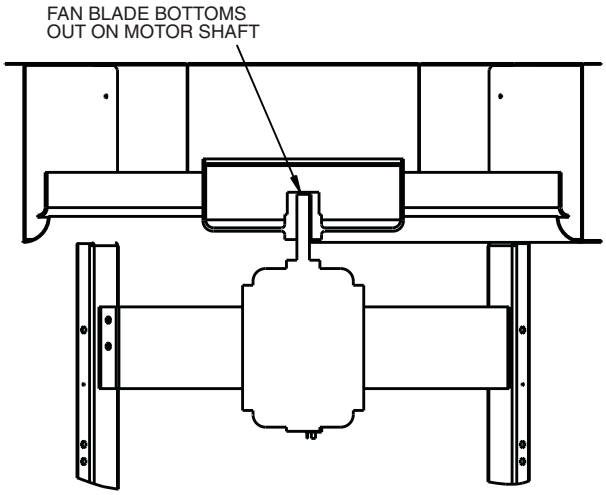



**Fig. 32 — Condenser-Fan Mounting**

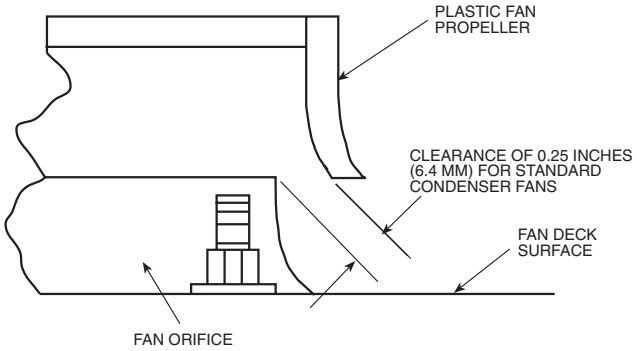



**Fig. 33 — Condenser-Fan Position (Standard Fan)**

The unit must be in operation at least 12 hours before the moisture indicator gives an accurate reading, and must be in contact with *liquid* refrigerant. At the first sign of moisture in the system, change the corresponding filter drier.

NOTE: Dual circuit (032-055 sizes) units have one indicator per circuit.

MINIMUM LOAD VALVE — On units equipped with the factory-installed capacity reduction option, a solenoid valve (minimum load valve) is located between the discharge line and the cooler entering-refrigerant line. The MBB cycles the solenoid to perform minimum load valve function.

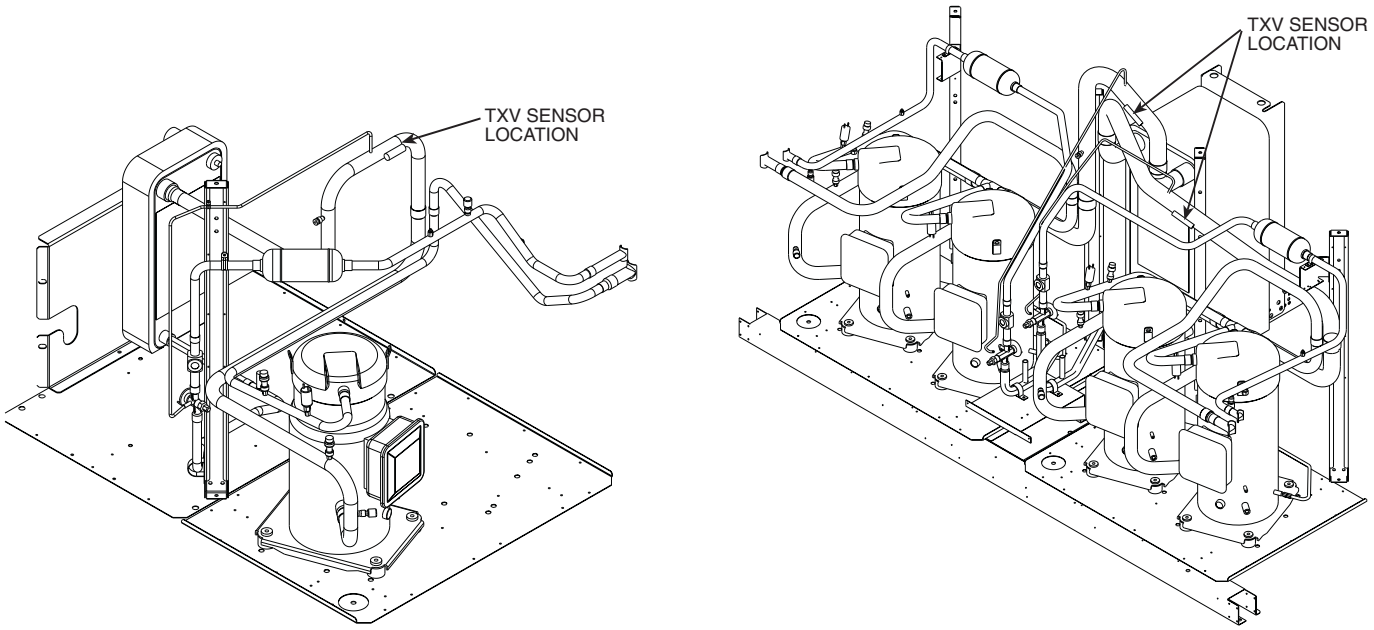



**Fig. 34 — Mounting Locations for TXV Sensing Bulb**

The amount of capacity reduction achieved by the minimum load valve is not adjustable. The total unit capacity with the minimum load valve is shown in Table 7.

PRESSURE RELIEF DEVICES — All units have one pressure relief device per circuit located in the liquid line which relieves at 210 F (100 C).

## Compressor and Unit Protective Devices

MANUAL STARTER — There is one manual starter per compressor in each unit. It protects the compressor(s) against overloading, locked rotor conditions, and primary single phasing. If the manual starter trips, determine the cause and correct it before resetting.

Manual starters are factory set; field adjustment should not be required. Manual starters are also factory installed for each condenser fan motor and factory-installed chilled water pump.

NOTE: Two-speed condenser fan motors on sizes 010-018 and 032-040 have manual starters so that the motor is protected while running in both low and high speed modes. Refer to Appendix B for factory settings.

COMPRESSOR INTERNAL THERMAL PROTECTION — All models include internal compressor protection. Models using the SM110 compressor (015 50 Hz and 018 60 Hz) have internal line break overloads. All other compressor models have internal discharge temperature thermostats that are wired in series with the compressor high pressure switch in the compressor motor junction box. The thermostat opens and shuts off the compressor if the discharge gas temperature exceeds 275 F (135 C). The thermostat will automatically reset when the temperature drops below a preset level, however, the control module will keep the unit locked off until the alert condition is reset.

## Check Unit Safeties

HIGH-PRESSURE SWITCH — A high-pressure switch is provided to protect each compressor and refrigeration system from unsafe high pressure conditions. See Table 32 for high-pressure switch settings.

The high-pressure switch is mounted in the discharge side of each compressor. A snubber is provided between the compressor discharge manifold and the high-pressure switch to prevent pressure pulsations from damaging the switch.

The high-pressure switch is mounted in the discharge line of each compressor. If an unsafe, high-pressure condition should exist, the switch opens and shuts off the affected compressor. The compressor feedback signal to J9 of the MBB then opens causing an alert condition. The MBB prevents the compressor from restarting until the alert condition is reset. The switch should open at the pressure corresponding to the appropriate switch setting as shown in Table 32.

**Table 32 — Factory Settings, High-Pressure Switch (Fixed)**

| UNIT | CUTOUT | | CUT-IN | |
|---|---|---|---|---|
| | Psig | kPa | Psig | kPa |
| 30RA | 426 ± 7 | 2937 ± 48 | 324 ± 20 | 2206 ± 138 |

Clear the alarm using the Scrolling Marquee display as described on page 42. The unit should restart after the compressor anti-short-cycle delay, built into the unit control module, expires.

PRESSURE TRANSDUCERS — Each refrigerant circuit is equipped with a suction and discharge pressure transducer. The transducers are NOT the same part number. The discharge pressure transducer is the universal pressure transducer while the suction pressure transducer is a discrete low pressure transducer. These inputs to the MBB are not only used to monitor the status of the unit, but to also maintain operation of the chiller within the compressor manufacturer's specified limits. The input to the MBB from the suction pressure transducer is also used to protect the compressor from operating at low pressure conditions. In some cases, the unit may not be able to run at full capacity. The control module will automatically reduce the capacity of a circuit as needed to maintain specified maximum/minimum operating pressures.

COOLER FREEZE-UP PROTECTION

**⚠ WARNING**

On medium temperature brine units, the brine must be properly mixed to prevent freezing at a temperature of at least 15 F (8.3 C) below the leaving-fluid temperature set point. Failure to provide the proper brine mixture is considered abuse and may void the Sterling warranty.

The Main Base Board (MBB) monitors leaving fluid temperature at all times. The MBB will rapidly remove stages of capacity as necessary to prevent freezing conditions due to the rapid loss of load or low cooler fluid flow.

When the cooler is exposed to lower ambient temperatures (34 F [1° C] or below), freeze-up protection is required using inhibited ethylene glycol.

HEATER CABLE — Optional factory-installed cooler and/or hydronic package heaters are cycled based on the input from the outside-air temperature sensor. These heaters, when installed, are designed to protect the cooler and/or hydronic package from freezing down to –20 F (–29 C). Power for these heaters is supplied from the main unit power.

The input from the low pressure transducer provides a back-up cooler freeze protection package. The MBB shuts down the unit when a low pressure condition exists that could cause the cooler to freeze up.

**⚠ CAUTION**

Do not disconnect main unit power when servicing compressor(s) if ambient temperature is below 40 F (4.4 C). Each compressor manual starter has a lockout feature. Depress the Stop Button and pull the lockout tab from the start button. Secure lock in place. If power to the unit must be off for a prolonged period, drain the cooler, hydronic package (if installed) and internal piping. Add glycol according to WINTER SHUTDOWN Step 2 below.

WINTER SHUTDOWN — At the end of the cooling season:

1. Drain the water/brine from the cooler, hydronic package (if installed) and internal piping.
2. Fill the package with at least 2 gallons (7.6 L) of ethylene glycol or other suitable uninhibited antifreeze solution to prevent any residual water in the cooler and hydronic package/piping from freezing.
3. At the beginning of the next cooling season, refill the cooler and add the recommended inhibitor.

**Thermistors —** Electronic control uses up to five 5 kΩ thermistors to sense temperatures used to control operation of the chiller. Thermistors T1, T2 and T9 are identical in their temperature and voltage drop performance. Accessory return gas thermistors are also 5 kΩ thermistors used to troubleshoot TXV superheat settings. Thermistor T10 has a 10 kΩ input channel and has a different set of temperature vs. resistance and voltage drop performance. Resistance at various temperatures are listed in Tables 33-36.

NOTE: For dual chiller operation, the control automatically configures the T10 input channel to be a 5 kΩ channel. A HH79NZ014 or HH79NZ029 thermistor should be used for dual chiller configurations.

Thermistor pin connection points are shown in Table 2. Thermistor T1 is located in a well at the bottom of the brazed plate heat exchanger for sizes 010-030 and in the leaving fluid piping for sizes 032-055.

Thermistor T2 is located in a well at the top of the brazed plate heat exchanger for sizes 010-030 and in the entering fluid piping for sizes 032-055. Thermistor T9 is factory installed in the compressor section behind a panel with a vent plug so that outside air flows across the sensor tip.

REPLACING THERMISTORS T1 and T2 — Add a small amount of thermal conductive grease to the thermistor well and end of probe. Thermistors are friction-fit thermistors, which must be slipped into receivers in the cooler (010-030) or fluid piping (032-055). For sizes 032-055, tighten the retaining nut ¼ turn past finger tight. See Fig. 35.

THERMISTOR/TEMPERATURE SENSOR CHECK — A high quality digital volt-ohmmeter is required to perform this check.

1. Connect the digital voltmeter across the appropriate themistor terminals at the J8 terminal strip on the Main Base Board (see Fig. 36).
2. Using the voltage reading obtained, read the sensor temperature from Tables 33-36.
3. To check thermistor accuracy, measure temperature at probe location with an accurate thermocouple-type temperature measuring instrument. Insulate thermocouple to avoid ambient temperatures from influencing reading. Temperature measured by thermocouple and temperature determined from thermistor voltage reading should be close, ± 5° F (3° C) if care was taken in applying thermocouple and taking readings.

If a more accurate check is required, unit must be shut down and thermistor removed and checked at a known temperature (freezing point or boiling point of water) using either voltage drop measured across thermistor at the J8 terminal, by determining the resistance with chiller shut down and thermistor disconnected from J8. Compare the values determined with the value read by the control in the Temperatures mode using the Scrolling Marquee display.

**Pressure Transducers —** Suction and discharge pressure transducers are installed on each circuit. No pressure transducer calibration is required. The transducers operate on a 5 vdc supply, which is generated by the Main Base Board (MBB). See Fig. 36 for transducer connections to the J8 connector on the MBB.

TROUBLESHOOTING — If a transducer is suspected of being faulty, first check the supply voltage to transducer. Supply voltage should be 5 vdc ± 0.2 v. If supply voltage is correct, compare pressure reading displayed on the Scrolling Marquee display module against pressure shown on a calibrated pressure gauge. Suction pressure should be within ± 2 psig. Discharge pressure should be within ± 5 psig. If the two readings are not reasonably close, replace the pressure transducer.

**Flow Sensor —** A flow switch is factory installed in the leaving fluid piping of all models. If the unit is equipped with an optional hydronic system, the flow switch is inside the pump cabinet. If nuisance trips of the sensor are occurring, follow the steps below to correct the situation:

1. Check to confirm that the factory installed strainer is clean. Use the blow-down valve provided or remove the screen and clean it. For the case of VFD controlled pumps, ensure that the minimum speed setting has not been changed.
2. Measure the pressure drop across the cooler or cooler/pump system and compare this to the system requirements.
3. Verify that cable connections at the switch and at the terminal block are secure.
4. For factory-installed hydronic systems, verify that:
   - All air has been purged from the system
   - Circuit setter balance valve has been correctly set
5. Pump impeller has been improperly trimmed and is not providing sufficient flow.
6. Wrong pump motor rotation. Pump must rotate clockwise when viewed from motor end of pump.

## Table 33 — 5K Thermistor Temperatures (°F) vs. Resistance/Voltage Drop (Voltage Drop for Entering, Leaving Water and Outside-Air Thermistors T1, T2, T9)

| TEMP (F) | VOLTAGE DROP (V) | RESISTANCE (Ohms) |
|---|---|---|
| –25 | 3.699 | 98,010 |
| –24 | 3.689 | 94,707 |
| –23 | 3.679 | 91,522 |
| –22 | 3.668 | 88,449 |
| –21 | 3.658 | 85,486 |
| –20 | 3.647 | 82,627 |
| –19 | 3.636 | 79,871 |
| –18 | 3.624 | 77,212 |
| –17 | 3.613 | 74,648 |
| –16 | 3.601 | 72,175 |
| –15 | 3.588 | 69,790 |
| –14 | 3.576 | 67,490 |
| –13 | 3.563 | 65,272 |
| –12 | 3.550 | 63,133 |
| –11 | 3.536 | 61,070 |
| –10 | 3.523 | 59,081 |
| –9 | 3.509 | 57,162 |
| –8 | 3.494 | 55,311 |
| –7 | 3.480 | 53,526 |
| –6 | 3.465 | 51,804 |
| –5 | 3.450 | 50,143 |
| –4 | 3.434 | 48,541 |
| –3 | 3.418 | 46,996 |
| –2 | 3.402 | 45,505 |
| –1 | 3.386 | 44,066 |
| 0 | 3.369 | 42,679 |
| 1 | 3.352 | 41,339 |
| 2 | 3.335 | 40,047 |
| 3 | 3.317 | 38,800 |
| 4 | 3.299 | 37,596 |
| 5 | 3.281 | 36,435 |
| 6 | 3.262 | 35,313 |
| 7 | 3.243 | 34,231 |
| 8 | 3.224 | 33,185 |
| 9 | 3.205 | 32,176 |
| 10 | 3.185 | 31,202 |
| 11 | 3.165 | 30,260 |
| 12 | 3.145 | 29,351 |
| 13 | 3.124 | 28,473 |
| 14 | 3.103 | 27,624 |
| 15 | 3.082 | 26,804 |
| 16 | 3.060 | 26,011 |
| 17 | 3.038 | 25,245 |
| 18 | 3.016 | 24,505 |
| 19 | 2.994 | 23,789 |
| 20 | 2.972 | 23,096 |
| 21 | 2.949 | 22,427 |
| 22 | 2.926 | 21,779 |
| 23 | 2.903 | 21,153 |
| 24 | 2.879 | 20,547 |
| 25 | 2.856 | 19,960 |
| 26 | 2.832 | 19,393 |
| 27 | 2.808 | 18,843 |
| 28 | 2.784 | 18,311 |
| 29 | 2.759 | 17,796 |
| 30 | 2.735 | 17,297 |
| 31 | 2.710 | 16,814 |
| 32 | 2.685 | 16,346 |
| 33 | 2.660 | 15,892 |
| 34 | 2.634 | 15,453 |
| 35 | 2.609 | 15,027 |
| 36 | 2.583 | 14,614 |
| 37 | 2.558 | 14,214 |
| 38 | 2.532 | 13,826 |
| 39 | 2.506 | 13,449 |
| 40 | 2.480 | 13,084 |
| 41 | 2.454 | 12,730 |
| 42 | 2.428 | 12,387 |
| 43 | 2.402 | 12,053 |
| 44 | 2.376 | 11,730 |
| 45 | 2.349 | 11,416 |
| 46 | 2.323 | 11,112 |
| 47 | 2.296 | 10,816 |
| 48 | 2.270 | 10,529 |
| 49 | 2.244 | 10,250 |
| 50 | 2.217 | 9,979 |
| 51 | 2.191 | 9,717 |
| 52 | 2.165 | 9,461 |
| 53 | 2.138 | 9,213 |
| 54 | 2.112 | 8,973 |
| 55 | 2.086 | 8,739 |
| 56 | 2.060 | 8,511 |
| 57 | 2.034 | 8,291 |
| 58 | 2.008 | 8,076 |
| 59 | 1.982 | 7,686 |
| 60 | 1.956 | 7,665 |
| 61 | 1.930 | 7,468 |
| 62 | 1.905 | 7,277 |
| 63 | 1.879 | 7,091 |
| 64 | 1.854 | 6,911 |
| 65 | 1.829 | 6,735 |
| 66 | 1.804 | 6,564 |
| 67 | 1.779 | 6,399 |
| 68 | 1.754 | 6,238 |
| 69 | 1.729 | 6,081 |
| 70 | 1.705 | 5,929 |
| 71 | 1.681 | 5,781 |
| 72 | 1.656 | 5,637 |
| 73 | 1.632 | 5,497 |
| 74 | 1.609 | 5,361 |
| 75 | 1.585 | 5,229 |
| 76 | 1.562 | 5,101 |
| 77 | 1.538 | 4,976 |
| 78 | 1.516 | 4,855 |
| 79 | 1.493 | 4,737 |
| 80 | 1.470 | 4,622 |
| 81 | 1.448 | 4,511 |
| 82 | 1.426 | 4,403 |
| 83 | 1.404 | 4,298 |
| 84 | 1.382 | 4,196 |
| 85 | 1.361 | 4,096 |
| 86 | 1.340 | 4,000 |
| 87 | 1.319 | 3,906 |
| 88 | 1.298 | 3,814 |
| 89 | 1.278 | 3,726 |
| 90 | 1.257 | 3,640 |
| 91 | 1.237 | 3,556 |
| 92 | 1.217 | 3,474 |
| 93 | 1.198 | 3,395 |
| 94 | 1.179 | 3,318 |
| 95 | 1.160 | 3,243 |
| 96 | 1.141 | 3,170 |
| 97 | 1.122 | 3,099 |
| 98 | 1.104 | 3,031 |
| 99 | 1.086 | 2,964 |
| 100 | 1.068 | 2,898 |
| 101 | 1.051 | 2,835 |
| 102 | 1.033 | 2,773 |
| 103 | 1.016 | 2,713 |
| 104 | 0.999 | 2,655 |
| 105 | 0.983 | 2,597 |
| 106 | 0.966 | 2,542 |
| 107 | 0.950 | 2,488 |
| 108 | 0.934 | 2,436 |
| 109 | 0.918 | 2,385 |
| 110 | 0.903 | 2,335 |
| 111 | 0.888 | 2,286 |
| 112 | 0.873 | 2,239 |
| 113 | 0.858 | 2,192 |
| 114 | 0.843 | 2,147 |
| 115 | 0.829 | 2,103 |
| 116 | 0.815 | 2,060 |
| 117 | 0.801 | 2,018 |
| 118 | 0.787 | 1,977 |
| 119 | 0.774 | 1,937 |
| 120 | 0.761 | 1,898 |
| 121 | 0.748 | 1,860 |
| 122 | 0.735 | 1,822 |
| 123 | 0.723 | 1,786 |
| 124 | 0.710 | 1,750 |
| 125 | 0.698 | 1,715 |
| 126 | 0.686 | 1,680 |
| 127 | 0.674 | 1,647 |
| 128 | 0.663 | 1,614 |
| 129 | 0.651 | 1,582 |
| 130 | 0.640 | 1,550 |
| 131 | 0.629 | 1,519 |
| 132 | 0.618 | 1,489 |
| 133 | 0.608 | 1,459 |
| 134 | 0.597 | 1,430 |
| 135 | 0.587 | 1,401 |
| 136 | 0.577 | 1,373 |
| 137 | 0.567 | 1,345 |
| 138 | 0.557 | 1,318 |
| 139 | 0.548 | 1,291 |
| 140 | 0.538 | 1,265 |
| 141 | 0.529 | 1,240 |
| 142 | 0.520 | 1,214 |
| 143 | 0.511 | 1,190 |
| 144 | 0.502 | 1,165 |
| 145 | 0.494 | 1,141 |
| 146 | 0.485 | 1,118 |
| 147 | 0.477 | 1,095 |
| 148 | 0.469 | 1,072 |
| 149 | 0.461 | 1,050 |
| 150 | 0.453 | 1,029 |
| 151 | 0.445 | 1,007 |
| 152 | 0.438 | 986 |
| 153 | 0.430 | 965 |
| 154 | 0.423 | 945 |
| 155 | 0.416 | 925 |
| 156 | 0.408 | 906 |
| 157 | 0.402 | 887 |
| 158 | 0.395 | 868 |
| 159 | 0.388 | 850 |
| 160 | 0.381 | 832 |
| 161 | 0.375 | 815 |
| 162 | 0.369 | 798 |
| 163 | 0.362 | 782 |
| 164 | 0.356 | 765 |
| 165 | 0.350 | 750 |
| 166 | 0.344 | 734 |
| 167 | 0.339 | 719 |
| 168 | 0.333 | 705 |
| 169 | 0.327 | 690 |
| 170 | 0.322 | 677 |
| 171 | 0.317 | 663 |
| 172 | 0.311 | 650 |
| 173 | 0.306 | 638 |
| 174 | 0.301 | 626 |
| 175 | 0.296 | 614 |
| 176 | 0.291 | 602 |
| 177 | 0.286 | 591 |
| 178 | 0.282 | 581 |
| 179 | 0.277 | 570 |
| 180 | 0.272 | 561 |
| 181 | 0.268 | 551 |
| 182 | 0.264 | 542 |
| 183 | 0.259 | 533 |
| 184 | 0.255 | 524 |
| 185 | 0.251 | 516 |
| 186 | 0.247 | 508 |
| 187 | 0.243 | 501 |
| 188 | 0.239 | 494 |
| 189 | 0.235 | 487 |
| 190 | 0.231 | 480 |
| 191 | 0.228 | 473 |
| 192 | 0.224 | 467 |
| 193 | 0.220 | 461 |
| 194 | 0.217 | 456 |
| 195 | 0.213 | 450 |
| 196 | 0.210 | 445 |
| 197 | 0.206 | 439 |
| 198 | 0.203 | 434 |
| 199 | 0.200 | 429 |
| 200 | 0.197 | 424 |
| 201 | 0.194 | 419 |
| 202 | 0.191 | 415 |
| 203 | 0.188 | 410 |
| 204 | 0.185 | 405 |
| 205 | 0.182 | 401 |
| 206 | 0.179 | 396 |
| 207 | 0.176 | 391 |
| 208 | 0.173 | 386 |
| 209 | 0.171 | 382 |
| 210 | 0.168 | 377 |
| 211 | 0.165 | 372 |
| 212 | 0.163 | 367 |
| 213 | 0.160 | 361 |
| 214 | 0.158 | 356 |
| 215 | 0.155 | 350 |
| 216 | 0.153 | 344 |
| 217 | 0.151 | 338 |
| 218 | 0.148 | 332 |
| 219 | 0.146 | 325 |
| 220 | 0.144 | 318 |
| 221 | 0.142 | 311 |
| 222 | 0.140 | 304 |
| 223 | 0.138 | 297 |
| 224 | 0.135 | 289 |
| 225 | 0.133 | 282 |

## Table 34 — 5K Thermistor Temperatures (°C) vs. Resistance/Voltage Drop (Voltage Drop for Entering, Leaving Water and Outside-Air Thermistors T1, T2, T9)

| TEMP (C) | VOLTAGE DROP (V) | RESISTANCE (Ohms) |
|---|---|---|
| **–32** | 3.705 | 100,260 |
| **–31** | 3.687 | 94,165 |
| **–30** | 3.668 | 88,480 |
| **–29** | 3.649 | 83,170 |
| **–28** | 3.629 | 78,125 |
| **–27** | 3.608 | 73,580 |
| **–26** | 3.586 | 69,250 |
| **–25** | 3.563 | 65,205 |
| **–24** | 3.539 | 61,420 |
| **–23** | 3.514 | 57,875 |
| **–22** | 3.489 | 54,555 |
| **–21** | 3.462 | 51,450 |
| **–20** | 3.434 | 48,536 |
| **–19** | 3.406 | 45,807 |
| **–18** | 3.376 | 43,247 |
| **–17** | 3.345 | 40,845 |
| **–16** | 3.313 | 38,592 |
| **–15** | 3.281 | 38,476 |
| **–14** | 3.247 | 34,489 |
| **–13** | 3.212 | 32,621 |
| **–12** | 3.177 | 30,866 |
| **–11** | 3.140 | 29,216 |
| **–10** | 3.103 | 27,633 |
| **–9** | 3.065 | 26,202 |
| **–8** | 3.025 | 24,827 |
| **–7** | 2.985 | 23,532 |
| **–6** | 2.945 | 22,313 |
| **–5** | 2.903 | 21,163 |
| **–4** | 2.860 | 20,079 |
| **–3** | 2.817 | 19,058 |
| **–2** | 2.774 | 18,094 |
| **–1** | 2.730 | 17,184 |
| **0** | 2.685 | 16,325 |
| **1** | 2.639 | 15,515 |
| **2** | 2.593 | 14,749 |
| **3** | 2.547 | 14,026 |
| **4** | 2.500 | 13,342 |
| **5** | 2.454 | 12,696 |
| **6** | 2.407 | 12,085 |
| **7** | 2.360 | 11,506 |
| **8** | 2.312 | 10,959 |
| **9** | 2.265 | 10,441 |
| **10** | 2.217 | 9,949 |
| **11** | 2.170 | 9,485 |
| **12** | 2.123 | 9,044 |
| **13** | 2.076 | 8,627 |
| **14** | 2.029 | 8,231 |
| **15** | 1.982 | 7,855 |
| **16** | 1.935 | 7,499 |
| **17** | 1.889 | 7,161 |
| **18** | 1.844 | 6,840 |
| **19** | 1.799 | 6,536 |
| **20** | 1.754 | 6,246 |
| **21** | 1.710 | 5,971 |
| **22** | 1.666 | 5,710 |
| **23** | 1.623 | 5,461 |
| **24** | 1.580 | 5,225 |
| **25** | 1.538 | 5,000 |
| **26** | 1.497 | 4,786 |
| **27** | 1.457 | 4,583 |
| **28** | 1.417 | 4,389 |
| **29** | 1.378 | 4,204 |
| **30** | 1.340 | 4,028 |
| **31** | 1.302 | 3,861 |
| **32** | 1.265 | 3,701 |
| **33** | 1.229 | 3,549 |
| **34** | 1.194 | 3,404 |
| **35** | 1.160 | 3,266 |
| **36** | 1.126 | 3,134 |
| **37** | 1.093 | 3,008 |
| **38** | 1.061 | 2,888 |
| **39** | 1.030 | 2,773 |
| **40** | 0.999 | 2,663 |
| **41** | 0.969 | 2,559 |
| **42** | 0.940 | 2,459 |
| **43** | 0.912 | 2,363 |
| **44** | 0.885 | 2,272 |
| **45** | 0.858 | 2,184 |
| **46** | 0.832 | 2,101 |
| **47** | 0.807 | 2,021 |
| **48** | 0.782 | 1,944 |
| **49** | 0.758 | 1,871 |
| **50** | 0.735 | 1,801 |
| **51** | 0.713 | 1,734 |
| **52** | 0.691 | 1,670 |
| **53** | 0.669 | 1,609 |
| **54** | 0.649 | 1,550 |
| **55** | 0.629 | 1,493 |
| **56** | 0.610 | 1,439 |
| **57** | 0.591 | 1,387 |
| **58** | 0.573 | 1,337 |
| **59** | 0.555 | 1,290 |
| **60** | 0.538 | 1,244 |
| **61** | 0.522 | 1,200 |
| **62** | 0.506 | 1,158 |
| **63** | 0.490 | 1,118 |
| **64** | 0.475 | 1,079 |
| **65** | 0.461 | 1,041 |
| **66** | 0.447 | 1,006 |
| **67** | 0.433 | 971 |
| **68** | 0.420 | 938 |
| **69** | 0.407 | 906 |
| **70** | 0.395 | 876 |
| **71** | 0.383 | 836 |
| **72** | 0.371 | 805 |
| **73** | 0.360 | 775 |
| **74** | 0.349 | 747 |
| **75** | 0.339 | 719 |
| **76** | 0.329 | 693 |
| **77** | 0.319 | 669 |
| **78** | 0.309 | 645 |
| **79** | 0.300 | 623 |
| **80** | 0.291 | 602 |
| **81** | 0.283 | 583 |
| **82** | 0.274 | 564 |
| **83** | 0.266 | 547 |
| **84** | 0.258 | 531 |
| **85** | 0.251 | 516 |
| **86** | 0.244 | 502 |
| **87** | 0.237 | 489 |
| **88** | 0.230 | 477 |
| **89** | 0.223 | 466 |
| **90** | 0.217 | 456 |
| **91** | 0.211 | 446 |
| **92** | 0.204 | 436 |
| **93** | 0.199 | 427 |
| **94** | 0.193 | 419 |
| **95** | 0.188 | 410 |
| **96** | 0.182 | 402 |
| **97** | 0.177 | 393 |
| **98** | 0.172 | 385 |
| **99** | 0.168 | 376 |
| **100** | 0.163 | 367 |
| **101** | 0.158 | 357 |
| **102** | 0.154 | 346 |
| **103** | 0.150 | 335 |
| **104** | 0.146 | 324 |
| **105** | 0.142 | 312 |
| **106** | 0.138 | 299 |
| **107** | 0.134 | 285 |

## Table 35 — 10K Thermistor Temperature (°F) vs. Resistance/Voltage Drop (For Thermistor T10)

| TEMP (F) | VOLTAGE DROP (V) | RESISTANCE (Ohms) |
|---|---|---|
| **–25** | 4.758 | 196,453 |
| **–24** | 4.750 | 189,692 |
| **–23** | 4.741 | 183,300 |
| **–22** | 4.733 | 177,000 |
| **–21** | 4.724 | 171,079 |
| **–20** | 4.715 | 165,238 |
| **–19** | 4.705 | 159,717 |
| **–18** | 4.696 | 154,344 |
| **–17** | 4.686 | 149,194 |
| **–16** | 4.676 | 144,250 |
| **–15** | 4.665 | 139,443 |
| **–14** | 4.655 | 134,891 |
| **–13** | 4.644 | 130,402 |
| **–12** | 4.633 | 126,183 |
| **–11** | 4.621 | 122,018 |
| **–10** | 4.609 | 118,076 |
| **–9** | 4.597 | 114,236 |
| **–8** | 4.585 | 110,549 |
| **–7** | 4.572 | 107,006 |
| **–6** | 4.560 | 103,558 |
| **–5** | 4.546 | 100,287 |
| **–4** | 4.533 | 97,060 |
| **–3** | 4.519 | 94,020 |
| **–2** | 4.505 | 91,019 |
| **–1** | 4.490 | 88,171 |
| **0** | 4.476 | 85,396 |
| **1** | 4.461 | 82,729 |
| **2** | 4.445 | 80,162 |
| **3** | 4.429 | 77,662 |
| **4** | 4.413 | 75,286 |
| **5** | 4.397 | 72,940 |
| **6** | 4.380 | 70,727 |
| **7** | 4.363 | 68,542 |
| **8** | 4.346 | 66,465 |
| **9** | 4.328 | 64,439 |
| **10** | 4.310 | 62,491 |
| **11** | 4.292 | 60,612 |
| **12** | 4.273 | 58,781 |
| **13** | 4.254 | 57,039 |
| **14** | 4.235 | 55,319 |
| **15** | 4.215 | 53,693 |
| **16** | 4.195 | 52,086 |
| **17** | 4.174 | 50,557 |
| **18** | 4.153 | 49,065 |
| **19** | 4.132 | 47,627 |
| **20** | 4.111 | 46,240 |
| **21** | 4.089 | 44,888 |
| **22** | 4.067 | 43,598 |
| **23** | 4.044 | 42,324 |
| **24** | 4.021 | 41,118 |
| **25** | 3.998 | 39,926 |
| **26** | 3.975 | 38,790 |
| **27** | 3.951 | 37,681 |
| **28** | 3.927 | 36,610 |
| **29** | 3.903 | 35,577 |
| **30** | 3.878 | 34,569 |
| **31** | 3.853 | 33,606 |
| **32** | 3.828 | 32,654 |
| **33** | 3.802 | 31,752 |
| **34** | 3.776 | 30,860 |
| **35** | 3.750 | 30,009 |
| **36** | 3.723 | 29,177 |
| **37** | 3.697 | 28,373 |
| **38** | 3.670 | 27,597 |
| **39** | 3.654 | 26,838 |
| **40** | 3.615 | 26,113 |
| **41** | 3.587 | 25,396 |
| **42** | 3.559 | 24,715 |
| **43** | 3.531 | 24,042 |
| **44** | 3.503 | 23,399 |
| **45** | 3.474 | 22,770 |
| **46** | 3.445 | 22,161 |
| **47** | 3.416 | 21,573 |
| **48** | 3.387 | 20,998 |
| **49** | 3.357 | 20,447 |
| **50** | 3.328 | 19,903 |
| **51** | 3.298 | 19,386 |
| **52** | 3.268 | 18,874 |
| **53** | 3.238 | 18,384 |
| **54** | 3.208 | 17,904 |
| **55** | 3.178 | 17,441 |
| **56** | 3.147 | 16,991 |
| **57** | 3.117 | 16,552 |
| **58** | 3.086 | 16,131 |
| **59** | 3.056 | 15,714 |
| **60** | 3.025 | 15,317 |
| **61** | 2.994 | 14,925 |
| **62** | 2.963 | 14,549 |
| **63** | 2.932 | 14,180 |
| **64** | 2.901 | 13,824 |
| **65** | 2.870 | 13,478 |
| **66** | 2.839 | 13,139 |
| **67** | 2.808 | 12,814 |
| **68** | 2.777 | 12,493 |
| **69** | 2.746 | 12,187 |
| **70** | 2.715 | 11,884 |
| **71** | 2.684 | 11,593 |
| **72** | 2.653 | 11,308 |
| **73** | 2.622 | 11,031 |
| **74** | 2.592 | 10,764 |
| **75** | 2.561 | 10,501 |
| **76** | 2.530 | 10,249 |
| **77** | 2.500 | 10,000 |
| **78** | 2.470 | 9,762 |
| **79** | 2.439 | 9,526 |
| **80** | 2.409 | 9,300 |
| **81** | 2.379 | 9,078 |
| **82** | 2.349 | 8,862 |
| **83** | 2.319 | 8,653 |
| **84** | 2.290 | 8,448 |
| **85** | 2.260 | 8,251 |
| **86** | 2.231 | 8,056 |
| **87** | 2.202 | 7,869 |
| **88** | 2.173 | 7,685 |
| **89** | 2.144 | 7,507 |
| **90** | 2.115 | 7,333 |
| **91** | 2.087 | 7,165 |
| **92** | 2.059 | 6,999 |
| **93** | 2.030 | 6,838 |
| **94** | 2.003 | 6,683 |
| **95** | 1.975 | 6,530 |
| **96** | 1.948 | 6,383 |
| **97** | 1.921 | 6,238 |
| **98** | 1.894 | 6,098 |
| **99** | 1.867 | 5,961 |
| **100** | 1.841 | 5,827 |
| **101** | 1.815 | 5,698 |
| **102** | 1.789 | 5,571 |
| **103** | 1.763 | 5,449 |
| **104** | 1.738 | 5,327 |
| **105** | 1.713 | 5,210 |
| **106** | 1.688 | 5,095 |
| **107** | 1.663 | 4,984 |
| **108** | 1.639 | 4,876 |
| **109** | 1.615 | 4,769 |
| **110** | 1.591 | 4,666 |
| **111** | 1.567 | 4,564 |
| **112** | 1.544 | 4,467 |
| **113** | 1.521 | 4,370 |
| **114** | 1.498 | 4,277 |
| **115** | 1.475 | 4,185 |
| **116** | 1.453 | 4,096 |
| **117** | 1.431 | 4,008 |
| **118** | 1.409 | 3,923 |
| **119** | 1.387 | 3,840 |
| **120** | 1.366 | 3,759 |
| **121** | 1.345 | 3,681 |
| **122** | 1.324 | 3,603 |
| **123** | 1.304 | 3,529 |
| **124** | 1.284 | 3,455 |
| **125** | 1.264 | 3,383 |
| **126** | 1.244 | 3,313 |
| **127** | 1.225 | 3,244 |
| **128** | 1.206 | 3,178 |
| **129** | 1.187 | 3,112 |
| **130** | 1.168 | 3,049 |
| **131** | 1.150 | 2,986 |
| **132** | 1.132 | 2,926 |
| **133** | 1.114 | 2,866 |
| **134** | 1.096 | 2,809 |
| **135** | 1.079 | 2,752 |
| **136** | 1.062 | 2,697 |
| **137** | 1.045 | 2,643 |
| **138** | 1.028 | 2,590 |
| **139** | 1.012 | 2,539 |
| **140** | 0.996 | 2,488 |
| **141** | 0.980 | 2,439 |
| **142** | 0.965 | 2,391 |
| **143** | 0.949 | 2,343 |
| **144** | 0.934 | 2,297 |
| **145** | 0.919 | 2,253 |
| **146** | 0.905 | 2,209 |
| **147** | 0.890 | 2,166 |
| **148** | 0.876 | 2,124 |
| **149** | 0.862 | 2,083 |
| **150** | 0.848 | 2,043 |
| **151** | 0.835 | 2,003 |
| **152** | 0.821 | 1,966 |
| **153** | 0.808 | 1,928 |
| **154** | 0.795 | 1,891 |
| **155** | 0.782 | 1,855 |
| **156** | 0.770 | 1,820 |
| **157** | 0.758 | 1,786 |
| **158** | 0.745 | 1,752 |
| **159** | 0.733 | 1,719 |
| **160** | 0.722 | 1,687 |
| **161** | 0.710 | 1,656 |
| **162** | 0.699 | 1,625 |
| **163** | 0.687 | 1,594 |
| **164** | 0.676 | 1,565 |
| **165** | 0.666 | 1,536 |
| **166** | 0.655 | 1,508 |
| **167** | 0.645 | 1,480 |
| **168** | 0.634 | 1,453 |
| **169** | 0.624 | 1,426 |
| **170** | 0.614 | 1,400 |
| **171** | 0.604 | 1,375 |
| **172** | 0.595 | 1,350 |
| **173** | 0.585 | 1,326 |
| **174** | 0.576 | 1,302 |
| **175** | 0.567 | 1,278 |
| **176** | 0.558 | 1,255 |
| **177** | 0.549 | 1,233 |
| **178** | 0.540 | 1,211 |
| **179** | 0.532 | 1,190 |
| **180** | 0.523 | 1,169 |
| **181** | 0.515 | 1,148 |
| **182** | 0.507 | 1,128 |
| **183** | 0.499 | 1,108 |
| **184** | 0.491 | 1,089 |
| **185** | 0.483 | 1,070 |
| **186** | 0.476 | 1,052 |
| **187** | 0.468 | 1,033 |
| **188** | 0.461 | 1,016 |
| **189** | 0.454 | 998 |
| **190** | 0.447 | 981 |
| **191** | 0.440 | 964 |
| **192** | 0.433 | 947 |
| **193** | 0.426 | 931 |
| **194** | 0.419 | 915 |
| **195** | 0.413 | 900 |
| **196** | 0.407 | 885 |
| **197** | 0.400 | 870 |
| **198** | 0.394 | 855 |
| **199** | 0.388 | 841 |
| **200** | 0.382 | 827 |
| **201** | 0.376 | 814 |
| **202** | 0.370 | 800 |
| **203** | 0.365 | 787 |
| **204** | 0.359 | 774 |
| **205** | 0.354 | 762 |
| **206** | 0.349 | 749 |
| **207** | 0.343 | 737 |
| **208** | 0.338 | 725 |
| **209** | 0.333 | 714 |
| **210** | 0.328 | 702 |
| **211** | 0.323 | 691 |
| **212** | 0.318 | 680 |
| **213** | 0.314 | 670 |
| **214** | 0.309 | 659 |
| **215** | 0.305 | 649 |
| **216** | 0.300 | 639 |
| **217** | 0.296 | 629 |
| **218** | 0.292 | 620 |
| **219** | 0.288 | 610 |
| **220** | 0.284 | 601 |
| **221** | 0.279 | 592 |
| **222** | 0.275 | 583 |
| **223** | 0.272 | 574 |
| **224** | 0.268 | 566 |
| **225** | 0.264 | 557 |

## Table 36 — 10K Thermistor Temperature (°C) vs. Resistance/Voltage Drop (For Thermistor T10)

| TEMP (C) | VOLTAGE DROP (V) | RESISTANCE (Ohms) |
|---|---|---|
| **–32** | 4.762 | 200,510 |
| **–31** | 4.748 | 188,340 |
| **–30** | 4.733 | 177,000 |
| **–29** | 4.716 | 166,342 |
| **–28** | 4.700 | 156,404 |
| **–27** | 4.682 | 147,134 |
| **–26** | 4.663 | 138,482 |
| **–25** | 4.644 | 130,402 |
| **–24** | 4.624 | 122,807 |
| **–23** | 4.602 | 115,710 |
| **–22** | 4.580 | 109,075 |
| **–21** | 4.557 | 102,868 |
| **–20** | 4.533 | 97,060 |
| **–19** | 4.508 | 91,588 |
| **–18** | 4.482 | 86,463 |
| **–17** | 4.455 | 81,662 |
| **–16** | 4.426 | 77,162 |
| **–15** | 4.397 | 72,940 |
| **–14** | 4.367 | 68,957 |
| **–13** | 4.335 | 65,219 |
| **–12** | 4.303 | 61,711 |
| **–11** | 4.269 | 58,415 |
| **–10** | 4.235 | 55,319 |
| **–9** | 4.199 | 52,392 |
| **–8** | 4.162 | 49,640 |
| **–7** | 4.124 | 47,052 |
| **–6** | 4.085 | 44,617 |
| **–5** | 4.044 | 42,324 |
| **–4** | 4.003 | 40,153 |
| **–3** | 3.961 | 38,109 |
| **–2** | 3.917 | 36,182 |
| **–1** | 3.873 | 34,367 |
| **0** | 3.828 | 32,654 |
| **1** | 3.781 | 31,030 |
| **2** | 3.734 | 29,498 |
| **3** | 3.686 | 28,052 |
| **4** | 3.637 | 26,686 |
| **5** | 3.587 | 25,396 |
| **6** | 3.537 | 24,171 |
| **7** | 3.485 | 23,013 |
| **8** | 3.433 | 21,918 |
| **9** | 3.381 | 20,883 |
| **10** | 3.328 | 19,903 |
| **11** | 3.274 | 18,972 |
| **12** | 3.220 | 18,090 |
| **13** | 3.165 | 17,255 |
| **14** | 3.111 | 16,464 |
| **15** | 3.056 | 15,714 |
| **16** | 3.000 | 15,000 |
| **17** | 2.944 | 14,323 |
| **18** | 2.889 | 13,681 |
| **19** | 2.833 | 13,071 |
| **20** | 2.777 | 12,493 |
| **21** | 2.721 | 11,942 |
| **22** | 2.666 | 11,418 |
| **23** | 2.610 | 10,921 |
| **24** | 2.555 | 10,449 |
| **25** | 2.500 | 10,000 |
| **26** | 2.445 | 9,571 |
| **27** | 2.391 | 9,164 |
| **28** | 2.337 | 8,776 |
| **29** | 2.284 | 8,407 |
| **30** | 2.231 | 8,056 |
| **31** | 2.178 | 7,720 |
| **32** | 2.127 | 7,401 |
| **33** | 2.075 | 7,096 |
| **34** | 2.025 | 6,806 |
| **35** | 1.975 | 6,530 |
| **36** | 1.926 | 6,266 |
| **37** | 1.878 | 6,014 |
| **38** | 1.830 | 5,774 |
| **39** | 1.784 | 5,546 |
| **40** | 1.738 | 5,327 |
| **41** | 1.692 | 5,117 |
| **42** | 1.648 | 4,918 |
| **43** | 1.605 | 4,727 |
| **44** | 1.562 | 4,544 |
| **45** | 1.521 | 4,370 |
| **46** | 1.480 | 4,203 |
| **47** | 1.439 | 4,042 |
| **48** | 1.400 | 3,889 |
| **49** | 1.362 | 3,743 |
| **50** | 1.324 | 3,603 |
| **51** | 1.288 | 3,469 |
| **52** | 1.252 | 3,340 |
| **53** | 1.217 | 3,217 |
| **54** | 1.183 | 3,099 |
| **55** | 1.150 | 2,986 |
| **56** | 1.117 | 2,878 |
| **57** | 1.086 | 2,774 |
| **58** | 1.055 | 2,675 |
| **59** | 1.025 | 2,579 |
| **60** | 0.996 | 2,488 |
| **61** | 0.968 | 2,400 |
| **62** | 0.940 | 2,315 |
| **63** | 0.913 | 2,235 |
| **64** | 0.887 | 2,157 |
| **65** | 0.862 | 2,083 |
| **66** | 0.837 | 2,011 |
| **67** | 0.813 | 1,943 |
| **68** | 0.790 | 1,876 |
| **69** | 0.767 | 1,813 |
| **70** | 0.745 | 1,752 |
| **71** | 0.724 | 1,693 |
| **72** | 0.703 | 1,637 |
| **73** | 0.683 | 1,582 |
| **74** | 0.663 | 1,530 |
| **75** | 0.645 | 1,480 |
| **76** | 0.626 | 1,431 |
| **77** | 0.608 | 1,385 |
| **78** | 0.591 | 1,340 |
| **79** | 0.574 | 1,297 |
| **80** | 0.558 | 1,255 |
| **81** | 0.542 | 1,215 |
| **82** | 0.527 | 1,177 |
| **83** | 0.512 | 1,140 |
| **84** | 0.497 | 1,104 |
| **85** | 0.483 | 1,070 |
| **86** | 0.470 | 1,037 |
| **87** | 0.457 | 1,005 |
| **88** | 0.444 | 974 |
| **89** | 0.431 | 944 |
| **90** | 0.419 | 915 |
| **91** | 0.408 | 889 |
| **92** | 0.396 | 861 |
| **93** | 0.386 | 836 |
| **94** | 0.375 | 811 |
| **95** | 0.365 | 787 |
| **96** | 0.355 | 764 |
| **97** | 0.345 | 742 |
| **98** | 0.336 | 721 |
| **99** | 0.327 | 700 |
| **100** | 0.318 | 680 |
| **101** | 0.310 | 661 |
| **102** | 0.302 | 643 |
| **103** | 0.294 | 626 |
| **104** | 0.287 | 609 |
| **105** | 0.279 | 592 |
| **106** | 0.272 | 576 |
| **107** | 0.265 | 561 |

**Strainer —** Periodic factory-installed strainer cleaning is required. Pressure drop across strainer in excess of 3 psi (21 kPa) indicates the need for cleaning. Normal (clean) pressure drop is approximately 1 psi (6.9 kPa). Open the factory-installed blowdown valve to clean the strainer. If required, shut the chiller down and remove the strainer screen to clean. When strainer has been cleaned, enter 'YES' for strainer maintenance done (S.T.MN) [Run Status, PM].

**Motormaster® V Controller —** The optional or accessory Motormaster V controller uses a 0 to 5 vdc signal input from a pressure transducer attached to the liquid line service valve gage port on each circuit. See Fig. 37. The pressure transducer is connected to terminals 2, 5 and 6 on the controller. The controller is factory configured and requires no field programming. If a situation arises where the drive does not function properly, the information provided below and Table 37 can be used to troubleshoot the drive.

**⚠ CAUTION**

If input power has not been applied to the drive for a period of time exceeding three years (due to storage, etc.), the electrolytic DC bus capacitors within the drive can change internally, resulting in excessive leakage current. This can result in premature failure of the capacitors if the drive is operated after such a long period of inactivity or storage. In order to reform the capacitors and prepare the drive for operation after a long period of inactivity, apply input power to the drive for 8 hours prior to actually operating the motor. Before attempting to operate the drive, motor, and driven equipment, be sure all procedures pertaining to installation and wiring have been properly followed.

**⚠ CAUTION**

DO NOT connect incoming AC power to output terminals T1, T2, and T3! Severe damage to the drive will result. Do not continuously cycle input power to the drive more than once every two minutes. Damage to the drive will result.

**⚠ WARNING**

Hazard of electrical shock! Wait three minutes after disconnecting incoming power before servicing drive. Capacitors retain charge after power is removed. Drive assembly includes externally mounted current limiting resistors. Use extreme caution when servicing the drive.

**⚠ WARNING**

When configured as shown below, this equipment is designed to start when it receives line power. Ensure that all personnel are clear of fans and guards are installed before applying power.

GENERAL OPERATION — This control varies condenser fan speed based on liquid pressure. The control is a Variable Frequency Drive (VFD) and is only compatible with motors rated for use with VFDs. The accompanying pressure transducer has a 0 to 5 v output range corresponding to a –40 to 460 psi range. The VFD provides a 5 v output for the transducer on pin 6.

This system is a reverse acting, proportional-integral (PI) control. The VFD will vary the motor speed to drive the liquid line pressure to the set point during ambient temperatures below 60 F. The set point is lower than a normal operating pressure during summer operation. At higher ambient temperatures, the fan will go to full speed (60 Hz or 50 Hz depending on model) and remain there since it can not go fast enough to bring the pressure down to the set point. When the VFD is at full speed, it acts just like a fixed speed fan.

When the ambient air temperature drops, a fan running at full speed draws too much air across the condenser coil to maintain a minimum condensing pressure/temperature. In these conditions, the VFD will slow down and begin to maintain a set point.

The VFD will display the set point as the default. The set point is displayed in speed as Hz and is configured by the start command jumper as detailed in Fig. 38.

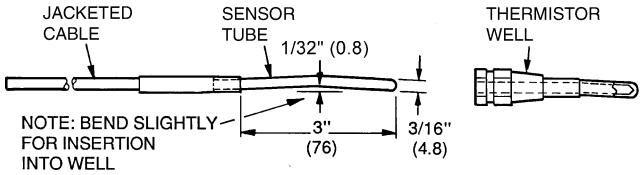
Motormaster V control can also be configured to follow an external control system to perform the PI control functions. See configuration section for details.

The real-time feedback signal (liquid line pressure, in volts) is displayed by viewing parameter 69. The real-time output frequency is displayed by viewing parameter 71.

SET POINTS — Operating modes are configured for R-22 with a set point of 135 psig on the liquid line.

INSTALLATION — See Fig. 38 for transducer wiring to the VFD.

NOTE: The drive is phase insensitive with respect to incoming line voltage. This means that the VFD will operate with any phase sequence of the incoming three-phase voltage.




FLUID-SIDE TEMPERATURE SENSORS (T1 AND T2)

NOTE: Dimensions in ( ) are in millimeters.

**Fig. 35 — Fluid-Side Temperature Sensors (T1 and T2)**

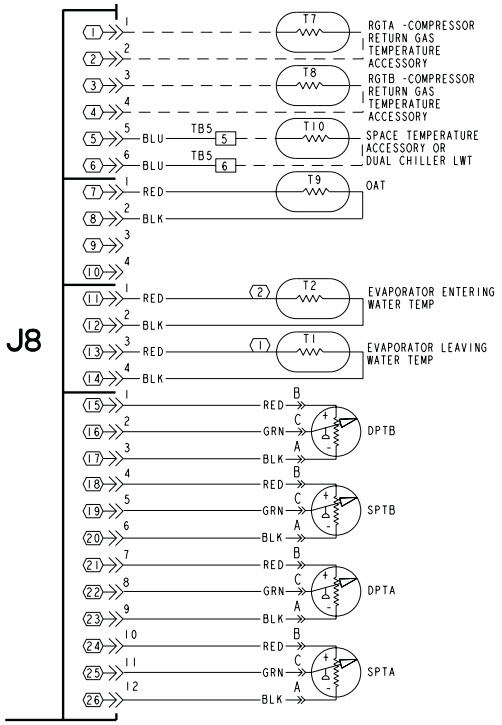



**Fig. 36 — Thermistor Connections to Main Base Board, J8 Connector**

PROGRAMMING

**⚠ CAUTION**

It is strongly recommended that the user NOT change any programming without consulting Sterling service personnel. Unit damage may occur from improper programming.

Motormaster V control is completely configured according to the inputs provided. No additional programming is necessary.

The drive can display 71 program parameters. Parameters 50-60 are monitor functions and cannot be changed. The remainder of the parameters can be changed after entering a password.

To enter password and change program values:

1. Press **Mode.**
2. Upper right decimal point blinks.
3. Display reads “00” (see Fig. 37). To enter the PROGRAM mode to access the parameters, press the **Mode** button (see Fig. 37). This will activate the PASSWORD prompt (if the password has not been disabled). The display will read “00” and the upper right-hand decimal point will be blinking.
4. Use the ▲ and ▼ buttons to scroll to the password value (the factory default password is “111”) and press the **Mode** button. Once the correct password value is entered, the display will read “P01”, which indicates that the PROGRAM mode has been accessed at the beginning of the parameter menu (P01 is the first parameter).

NOTE: If the display flashes “Er”, the password was incorrect, and the process to enter the password must be repeated.

5. Press **Mode** to display present parameter setting. Upper right decimal point blinks.

   Use the ▲ and ▼ buttons to scroll to the desired parameter number.

Once the desired parameter number is found, press the **Mode** button to display the present parameter setting. The upper right-hand decimal point will begin blinking, indicating that the present parameter setting is being displayed, and that it can be changed by using the up and down buttons. Use ▲ and ▼ to change setting. Press **Mode** to store new setting.

Pressing the **Mode** will store the new setting and also exit the PROGRAM mode. To change another parameter, press the **Mode** key again to re-enter the PROGRAM mode (the parameter menu will be accessed at the parameter that was last viewed or changed before exiting). If the **Mode** key is pressed within two minutes of exiting the PROGRAM mode, the password is not required access the parameters. After two minutes, the password must be entered in order to access the parameters again.

To change password: first enter the current password then change parameter P44 to the desired password.

To disable automatic control mode and enter manual speed control mode:

1. Change P05 to ‘01- keypad’.
2. Push UP and DOWN arrow key to set manual speed.
3. Set P05 to ‘05 - R22’ to restore automatic control.

To provide manual start/stop control:

With power removed from VFD, remove start command jumper and install a switch between the appropriate start terminals as required in Fig 37.

EPM CHIP — The drive uses a electronic programming module (EPM) chip to store the program parameters. This is an EEPROM memory chip and is accessible from the front of the VFD. It should not be removed with power applied to the VFD.

LIQUID LINE PRESSURE SET POINT ADJUSTMENT — Adjusting the set point is not recommended due to possible interaction with other head pressure software algorithms or controls. In situations where the set point must be changed, the set point for R-22 is found in P34. A higher value will result in a higher liquid line set point. Example: increasing the factory default (P34) set point from 18.0 to 19.0 will increase the liquid line pressure by approximately 10 psi.

LOSS OF SCN COMMUNICATIONS — Sterlco Comfort Network (SCN) communications with external control systems can be affected by high frequency electrical noise generated by the Motormaster V control. Ensure unit is well grounded to eliminate ground currents along communication lines.

If communications are lost only while Motormaster V control is in operation, order a signal isolator (CEAS420876-2) and power supplies (CEAS221045-01, 2 required) for the SCN communication line.

Fault Codes — The drive is programmed to automatically restart after a fault and will attempt to restart three times after a fault (the drive will not restart after CF, cF, GF, F1, F2-F9, or Fo faults). If all three restart attempts are unsuccessful, the drive will trip into FAULT LOCKOUT (LC), which requires a manual reset.

NOTE: Since faults may be reset as incoming power is cycled, you may need to observe current fault code before the Sterling unit control turns off the VFD. Most recent faults can be accessed using parameter 50. If necessary, remove start jumper and energize condenser fan contactor using Service Test. This will allow programming and access to fault history.

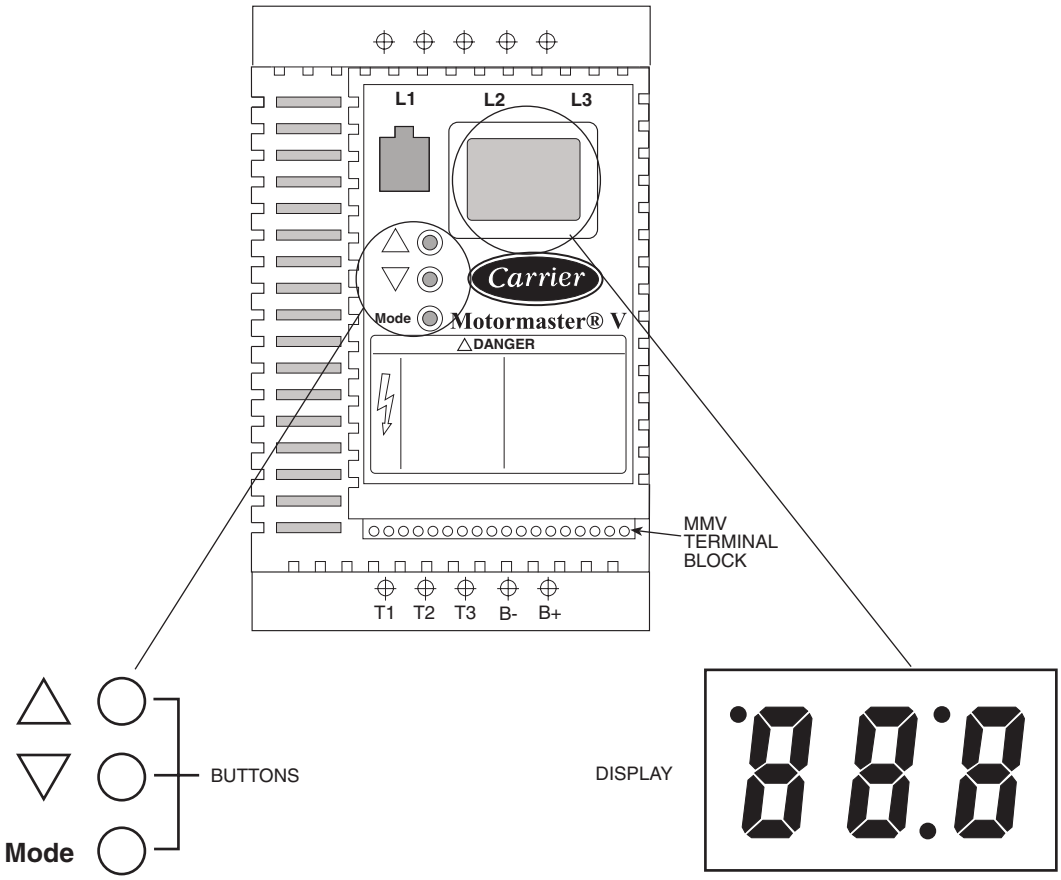
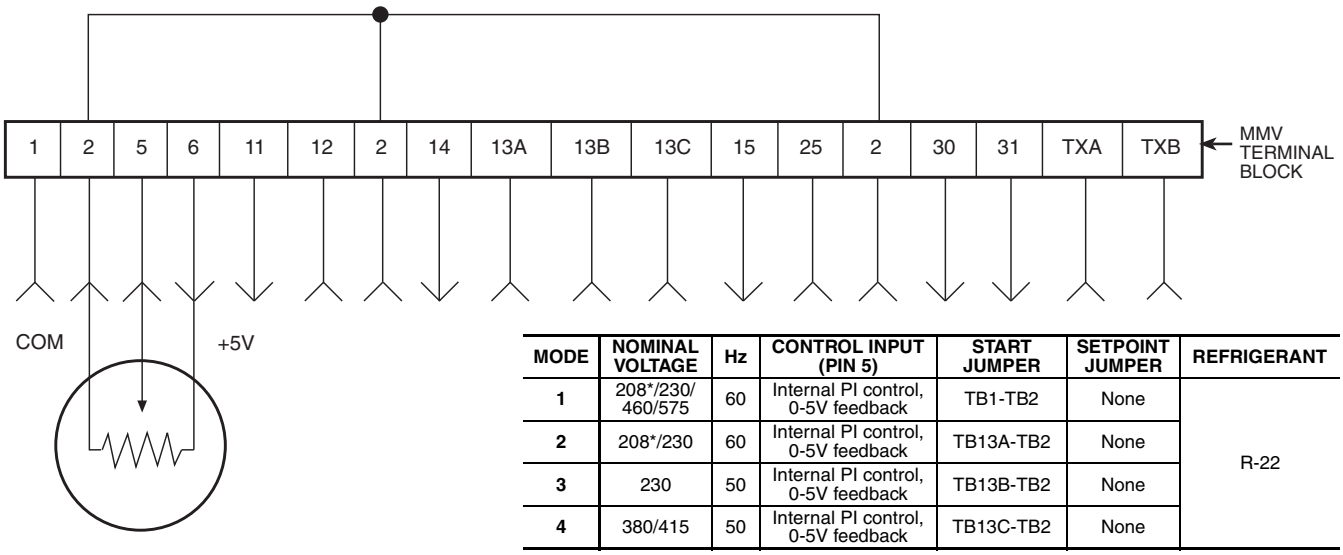



**Fig. 37 — Motormaster® V Mode Buttons and Mode Display**




| MODE | NOMINAL VOLTAGE | Hz | CONTROL INPUT (PIN 5) | START JUMPER | SETPOINT JUMPER | REFRIGERANT |
|---|---|---|---|---|---|---|
| 1 | 208*/230/ 460/575 | 60 | Internal PI control, 0-5V feedback | TB1-TB2 | None | R-22 |
| 2 | 208*/230 | 60 | Internal PI control, 0-5V feedback | TB13A-TB2 | None | |
| 3 | 230 | 50 | Internal PI control, 0-5V feedback | TB13B-TB2 | None | |
| 4 | 380/415 | 50 | Internal PI control, 0-5V feedback | TB13C-TB2 | None | |

*At 208 v, the drive can run in either mode.

**Fig. 38 — Pressure Transducer and Start Command Jumper Wiring**

**Table 37 — Fault Codes**

| FAULT CODE | DESCRIPTION | SOLUTION |
|---|---|---|
| AF | High Temperature Fault: Ambient temperature is too high; Cooling fan has failed (if equipped). | Check cooling fan operation |
| CF | Control Fault: A blank EPM, or an EPM with corrupted data has been installed. | Perform a factory reset using Parameter 48 — PROGRAM SELECTION. |
| cF | Incompatibility Fault: An EPM with an incompatible parameter version has been installed. | Either remove the EPM or perform a factory reset (Parameter 48) to change the parameter version of the EPM to match the parameter version of the drive. |
| CL | CURRENT LIMIT: The output current has exceeded the CURRENT LIMIT setting (Parameter 25) and the drive is reducing the output frequency to reduce the output current. If the drive remains in CURRENT LIMIT too long, it can trip into a CURRENT OVERLOAD fault (PF). | Check for loose electrical connections.<br>Check for faulty condenser fan motor.<br>Check Parameter P25 from Table 38 is set correctly. |
| GF | Data Fault: User data and OEM defaults in the EPM are corrupted. | Restore factory defaults P48, see section above. If that does not work, replace EPM. |
| HF | High DC Bus Voltage Fault: Line voltage is too high; Deceleration rate is too fast; Overhauling load. | Check line voltage — set P01 appropriately |
| JF | Serial Fault: The watchdog timer has timed out, indicating that the serial link has been lost. | Check serial connection (computer)<br>Check settings for PXX.<br>Check settings in communication software to match PXX. |
| LF | Low DC Bus Voltage Fault: Line voltage is too low. | Check line voltage — set P01 appropriately |
| OF | Output Transistor Fault: Phase to phase or phase to ground short circuit on the output; Failed output transistor; Boost settings are too high; Acceleration rate is too fast. | Reduce boost or increase acceleration values. If unsuccessful, replace drive. |
| PF | Current Overload Fault: VFD is undersized for the application; Mechanical problem with the driven equipment. | Check line voltage — set P01 appropriately<br>Check for dirty coils<br>Check for motor bearing failure |
| SF | Single-phase Fault: Single-phase input power has been applied to a three-phase drive. | Check input power phasing |
| F1 | EPM Fault: The EPM is missing or damaged. | |
| F2-F9, Fo | Internal Faults: The control board has sensed a problem | Consult factory |
| Drive display = 60.0 even though it is cold outside and it should be running slower | Feedback signal is above set point | Check for proper set point<br>Check liquid line pressure |
| Drive display = '---' even though drive should be running | Start jumper is missing | Replace start jumper. See section above |
| Drive display = 8.0 even though fan should be running faster | Feedback signal is below set point and fan is at minimum speed | Check for proper set point<br>Check liquid line pressure |
| VFD flashes 57 and LCS | Feedback or speed signal lost. Drive will operate at 57 Hz until reset or loss of start command. Resetting requires cycling start command (or power). | In stand alone mode: Check transducer wiring and feedback voltage. Feedback voltage displayed on P-69. Pin 6 should be 5 v output. Pin 5 (feedback) should be somewhere between 0 and 5 v. |

Manual Reset — If fault condition has been removed, cycle power to the chiller to reset the VFD.

Troubleshooting — Troubleshooting the Motormaster® V control requires a combination of observing system operation and VFD information. The drive provides 2 kinds of troubleshooting modes: a status matrix using the 3-digit display (P57, P58) and real time monitoring of key inputs and outputs. The collective group is displayed through parameters 50-60 and all values are read-only.

- **P50: FAULT HISTORY —** Last 8 faults
- **P51: SOFTWARE version**
- **P52: DC BUS VOLTAGE —** in percent of nominal. Usually rated input voltage x 1.4
- **P53: MOTOR VOLAGE —** in percent of rated output voltage
- **P54: LOAD —** in percent of drives rated output current rating
- **P55: VDC INPUT —** in percent of maximum input: 100 will indicate full scale which is 5 v
- **P56 4-20 mA INPUT —** in percent of maximum input. 20% = 4 mA, 100% = 20 mA

Manual Starter Trip — If the VFD manual starter (MS-FC-HS, MS-FC-A1 or MS-FC-B1 depending on model) trips, locate the inrush current protectors (3 round black disks per motor) and verify their resistance. For units operating at 208 v or 230 v, these devices should measure approximately 7 ohms. For all other voltages, they should measure approximately 20 ohms. Check value with mating plug disconnected, power to chiller off and at ambient temperature (not hot immediately after stopping VFD). These are standard resistances at 77 F (25 C). Resistance values decrease at higher temperatures and increase at lower temperatures.

## Table 38 — Motormaster® V Program Parameters for Operating Modes

| PARAMETERS | DESCRIPTION | MODE 1 | MODE 2 | MODE 3 | MODE 4 |
|---|---|---|---|---|---|
| **P01** | Line Voltage: 01 = low line, 02 = high line | 01 | 02 | 01 | 02 |
| **P02** | **SterIco** Freq: 01 = 4 kHz, 02 = 6 kHz, 03 = 8 kHz | 01 | 01 | 01 | 01 |
| **P03** | Startup mode: flying restart | 06 | 06 | 06 | 06 |
| **P04** | Stop mode: coast to stop | 01 | 01 | 01 | 01 |
| **P05** | Standard Speed source: 01= keypad, 04=4-20mA (NO PI), 05= R22, 06=R134a | 05 | 05 | 05 | 05 |
| **P06** | TB-14 output: 01 = none | 01 | 01 | 01 | 01 |
| **P08** | TB-30 output: 01 = none | 01 | 01 | 01 | 01 |
| **P09** | TB-31 Output: 01 = none | 01 | 01 | 01 | 01 |
| **P10** | TB-13A function sel: 01 = none | 01 | 01 | 01 | 01 |
| **P11** | TB-13B function sel: 01 = none | 01 | 01 | 01 | 01 |
| **P12** | TB-13C function sel: 01 = none | 01 | 01 | 01 | 01 |
| **P13** | TB-15 output: 01 = none | 01 | 01 | 01 | 01 |
| **P14** | Control: 01 = Terminal strip | 01 | 01 | 01 | 01 |
| **P15** | Serial link: 02 = enabled 9600,8,N,2 with timer | 02 | 02 | 02 | 02 |
| **P16** | Units editing: 02 = whole units | 02 | 02 | 02 | 02 |
| **P17** | Rotation: 01 = forward only, 03 = reverse only | 01 | 01 | 01 | 01 |
| **P19** | Acceleration time: 10 sec | 10 | 10 | 10 | 10 |
| **P20** | Deceleration time: 10 sec | 10 | 10 | 10 | 10 |
| **P21** | DC brake time: 0 | 0 | 0 | 0 | 0 |
| **P22** | DC BRAKE VOLTAGE 0% | 0 | 0 | 0 | 0 |
| **P23** | Min freq = 8 Hz ~ 100 – 160 rpm | 8 | 8 | 8 | 8 |
| **P24** | Max freq | 60 | 60 | 50 | 50 |
| **P25** | Current limit: (%) | 125 | 110 | 125 | 110 |
| **P26** | Motor overload: 100 | 100 | 100 | 100 | 100 |
| **P27** | Base freq: 60 or 50 Hz | 60 | 60 | 50 | 50 |
| **P28** | Fixed boost: 0.5% at low frequencies | 0.5 | 0.5 | 0.5 | 0.5 |
| **P29** | Accel boost: 0% | 0 | 0 | 0 | 0 |
| **P30** | Slip compensation: 0% | 0 | 0 | 0 | 0 |
| **P31** | Preset spd #1: speed if loss of control signal | 57 | 57 | 47 | 47 |
| **P32** | Preset spd #2: 0 | 0 | 0 | 0 | 0 |
| **P33** | Preset spd #3: 0 | 0 | 0 | 0 | 0 |
| **P34** | Preset spd 4 default — R22 set point. TB12-2 open | 18.0 | 18.0 | 18.0 | 18.0 |
| **P35** | Preset spd 5 default — R134a set point. TB12-2 closed | 12.6 | 12.6 | 12.6 | 12.6 |
| **P36** | Preset spd 6 default | 0 | 0 | 0 | 0 |
| **P37** | Preset spd 7 default | 0 | 0 | 0 | 0 |
| **P38** | Skip bandwidth | 0 | 0 | 0 | 0 |
| **P39** | Speed scaling | 0 | 0 | 0 | 0 |
| **P40** | Frequency scaling 50 or 60 Hz | 60 | 60 | 50 | 50 |
| **P41** | Load scaling: default (not used so NA) | 200 | 200 | 200 | 200 |
| **P42** | Accel/decel #2: default (not used so NA) | 60 | 60 | 60 | 60 |
| **P43** | Serial address | 1 | 1 | 1 | 1 |
| **P44** | Password:111 | 111 | 111 | 111 | 111 |
| **P45** | Speed at min signal: 8 Hz; used when PID mode is disabled and 4-20mA input is at 4 mA | 8 | 8 | 8 | 8 |
| **P46** | Speed at max feedback: 60 or 50 Hz. Used when PID disabled and 4-20mA input is at 20 mA | 60 | 60 | 50 | 50 |
| **P47** | Clear history? 01 = maintain. (set to 02 to clear) | 01 | 01 | 01 | 01 |
| **P48** | Program selection: Program 1 – 12 | 01 | 02 | 03 | 04 |
| **P61** | PI Mode: 05= reverse, 0-5V, 01 = no PID | 05 | 05 | 05 | 05 |
| **P62** | Min feedback = 0 (0V *10) | 0 | 0 | 0 | 0 |
| **P63** | Max feedback = 50 (5V * 10) | 50 | 50 | 50 | 50 |
| **P64** | Proportional gain = 4% | 4 | 4 | 4 | 4 |
| **P65** | Integral gain = .2 | .2 | .2 | .2 | .2 |
| **P66** | PI acell/decel (set point change filter) = 5 | 5 | 5 | 5 | 5 |
| **P67** | Min alarm | 0 | 0 | 0 | 0 |
| **P68** | Max alarm | 0 | 0 | 0 | 0 |

LEGEND

**NA** — Not Applicable
**PID** — Proportional Integral Derivative
**TB** — Terminal Block

REPLACING DEFECTIVE MODULES — The *Comfort*-Link™ replacement modules are shown in Table 39. If the Main Base Board (MBB) has been replaced, verify that all configuration data is correct. Follow the Configuration mode table and verify that all items under sub-modes UNIT, OPT1 and OPT2 are correct. Any additional field-installed accessories or options (RSET, SLCT sub-modes) should also be verified as well as any specific time and maintenance schedules.

Refer to the Start-Up Checklist for 30RA Liquid Chillers (completed at time of original start-up) found in the job folder. This information is needed later in this procedure. If the checklist does not exist, fill out the current information in the Configuration mode on a new checklist. Tailor the various options and configurations as needed for this particular installation.

**⚠ CAUTION**

Electrical shock can cause personal injury. Disconnect all electrical power before servicing.

1. Check that all power to unit is off. Carefully disconnect all wires from the defective module by unplugging its connectors.
2. Remove the defective module by removing its mounting screws with a Phillips screwdriver, and removing the module from the control box. Save the screws later use.
3. Verify that the instance jumper (MBB) or address switches (all other modules) exactly match the settings of the defective module.

NOTE: Handle boards by mounting standoffs only to avoid electrostatic discharge.

4. Package the defective module in the carton of the new module for return to Sterling.
5. Mount the new module in the unit's control box using a Phillips screwdriver and the screws saved in Step 2.
6. Reinstall all module connectors. For accessory Navigator replacement, make sure the plug is installed at TB3 in the LEN connector.
7. Carefully check all wiring connections before restoring power.
8. Verify the ENABLE/OFF/REMOTE CONTACT switch is in the OFF position.
9. Restore control power. Verify that all module red LEDs blink in unison. Verify that all green LEDs are blinking and that the Scrolling Marquee or Navigator display is communicating correctly.
10. Verify all configuration information, settings, set points and schedules. Return the ENABLE/OFF/REMOTE CONTACT switch to its previous position.

**Table 39 — Replacement Modules**

| MODULE | REPLACEMENT PART NO. (with Software) | REPLACEMENT PART NO. (without Software) |
|---|---|---|
| Main Base Board (MBB) | 30RA501102 | HK50AA029 |
| Scrolling Marquee Display | HK50AA031 | HK50AA030 |
| Energy Management Module (EMM) | 30GT515218 | HK50AA028 |
| Navigator Display | HK50AA033 | N/A |

**Hydronic Package —** If the unit is equipped with a factory-installed hydronic package, consult the information below for proper maintenance and service. In addition to this information, each factory-installed hydronic package is supplied with a packet of information supplied by the manufacturer, Bell & Gossett. Sterling/Sterlco strongly recommends that this information be thoroughly reviewed prior to operation of the chiller.

PUMP PERFORMANCE CHECK — The factory-installed pumps in the 30RA units are shipped with a single impeller size available for that pump. The pump was selected based on the flow and head requirements as provided to Sterling. It is not uncommon for actual pump duty to be different than what was anticipated at time of selection. In many cases, it may be desirable to make some field modifications to obtain optimum pump performance.

Before any pump modifications are made, it is recommended that actual pump performance be verified and compared to the applicable pump curve. See base unit installation instructions. This can be done in a variety of ways:

1. If pump impeller diameter is known:
   a. Connect a differential pressure gage across the pump at the ports provided on the pump volutes.
   b. Read GPM from applicable impeller curve.
2. If pump impeller diameter is not known:

   If pump impeller diameter has been trimmed and the size is not known, it is necessary to determine which impeller curve to read.

   The easiest way to confirm pump performance is to "dead-head" the pump and read the differential pressure across the pressure ports on the pump. "Dead-heading" can be done by shutting the circuit setter valve on the discharge side of the pump.

   NOTE: Although not all pumps can be safely "dead-headed", centrifugal pumps (such as on the 30RA units) can be "dead-headed" for short amounts of time. It is recommended to keep the time short due to excessive heat build-up in the pump.

   Since the "dead-head" condition is a no-flow condition, the head will correspond to the intersection of an impeller curve with the vertical axis of the pump chart. The correct impeller diameter is that which corresponds to the measured head.
3. Once the impeller diameter is known, proceed as in Step 1.
4. Water flow rate can be determined by using a differential pressure gage with the Bell & Gossett circuit setter balance valve calculator. (This information is also provided in the installation instructions.) This method will not directly measure pressure differential seen by the pump, but can be used to "double-check" the pump measurement.
5. Verify that cable connections at the switch and at the terminal block are secure.
6. For factory-installed hydronic system, verify that:
   - All air has been purged from the system.
   - Circuit setter balance valve has been correctly set.
7. Pump impeller has been improperly trimmed and is not providing sufficient flow.
8. Wrong pump motor rotation. Pump must rotate clockwise when viewed from motor end of pump.

PUMP MODIFICATIONS AND IMPELLER TRIMMING — See applicable section in the Installation instructions.

RESET OF CHILLER WATER FLOW — See applicable section in the Installation instructions.

CHANGING OF PUMP SEALS — See Bell & Gossett service instruction manual provided with the hydronic package.

## MAINTENANCE

**Recommended Maintenance Schedule —** The following are only recommended guidelines. Jobsite conditions may dictate that maintenance schedule is performed more often than recommended.

Routine:

For machines with E-coat Condenser Coils:

- Check condenser coils for debris, clean as necessary with Sterling approved coil cleaner.
- Periodic clean water rinse, especially in coastal and industrial applications.

Every month:

- Check condenser coils for debris, clean as necessary with Sterling approved coil cleaner.
- Check moisture indicating sight glass for possible refrigerant loss and presence of moisture.

Every 3 months (for all machines):

- Check refrigerant charge.
- Check all refrigerant joints and valves for refrigerant leaks, repair as necessary.
- Check chilled water flow switch operation.
- Check condenser coils for debris, clean as necessary with Sterling approved coil cleaner.
- Check all condenser fans for proper operation.
- Check compressor oil level.
- Check crankcase heater operation.

Every 12 months (for all machines):

- Check all electrical connections, tighten as necessary.
- Inspect all contactors and relays, replace as necessary.
- Check accuracy of thermistors, replace if greater than ± 2° F (1.2° C) variance from calibrated thermometer.
- Obtain and test an oil sample. Change oil only if necessary.
- Check to be sure that the proper concentration of antifreeze is present in the chilled water loop, if applicable.
- Verify that the chilled water loop is properly treated.
- Check refrigerant filter driers for excessive pressure drop, replace as necessary.
- Check chilled water strainers, clean as necessary.
- Check cooler heater operation, if equipped.
- Check condition of condenser fan blades and that they are securely fastened to the motor shaft.
- Perform Service Test to confirm operation of all components.
- Check for excessive cooler approach (Leaving Chilled Water Temperature — Saturated Suction Temperature) which may indicate fouling. Clean cooler vessel if necessary.

## PRE-START-UP

IMPORTANT: Before beginning Pre-Start-Up or Start-Up, complete Start-Up Checklist for 30RA Liquid Chiller at end of this publication (page CL-1 to CL-8). The Checklist assures proper start-up of a unit, and provides a record of unit condition, application requirements, system information, and operation at initial start-up.

Do not attempt to start the chiller until following checks have been completed.

### System Check

1. Check all auxiliary components, such as chilled fluid pumps, air-handling equipment, or other equipment to which the chiller supplies liquid. Consult manufacturer's instructions. Verify that any pump interlock contacts have been properly installed. If the unit If the unit has field-installed accessories, be sure all are properly installed and wired correctly. Refer to unit wiring diagrams.
2. Use the Scrolling Marquee display to adjust the Cooling Set Point.
3. Fill chilled fluid circuit with clean water (with recommended inhibitor added) or other non-corrosive fluid to be cooled. Bleed all air out of the high points of the system. If chilled water is to be maintained at a temperature below 40 F (4.4 C) or outdoor temperatures are expected to be below 32 F (0° C), a brine of sufficient concentration must be used to prevent freeze-up at anticipated suction temperatures. See Table 40.
4. Check tightness of all electrical connections.
5. Oil should be visible in the compressor sightglass(es). See Fig. 39. An acceptable oil level in the compressors is from ¼ to ¾ of sight glass. Adjust the oil level as required. See Check Oil Charge section on page 60 for Sterling approved oils.
6. Electrical power source must agree with unit nameplate.
7. All condenser fan and factory installed hydronic package pump motors are three phase. Check for proper rotation of condenser fans first BEFORE attempting to start pumps or compressors. To reverse rotation, interchange any two of the main incoming power leads.
8. Be sure system is fully charged with refrigerant (see Check Refrigerant Charge section on page 75).
9. If unit is a brine unit, check to ensure proper brine concentration is used to prevent freezing.
10. Verify proper operation of cooler and hydronic package heaters (if installed). Heaters operate at the same voltage as the main incoming power supply and are single phase. Heater current is approximately .4 amps for 380, 400, 460 and 575 v units. Heater current is approximately .8 amps for 230 v units.

**Table 40 — Minimum Cooler Flow Rates and Minimum Loop Volume**

| UNIT SIZE 30RA | COOLER MINIMUM FLOW | | MINIMUM COOLER LOOP VOLUME | |
|---|---|---|---|---|
| | Gpm | L/s | Gal. | L |
| **010** | 12 | .76 | 40 | 151.2 |
| **015** | 16 | 1.01 | 55 | 207.9 |
| **018** | 19 | 1.20 | 48 | 181.4 |
| **022** | 26 | 1.64 | 65 | 245.7 |
| **025** | 29 | 1.83 | 71 | 268.3 |
| **030** | 33 | 2.08 | 82 | 309.3 |
| **035** | 42 | 2.65 | 102 | 393.1 |
| **040** | 45 | 2.80 | 113 | 449.8 |
| **042** | 48 | 3.02 | 119 | 427.1 |
| **045** | 52 | 3.28 | 129 | 487.6 |
| **050** | 57 | 3.59 | 142 | 536.6 |
| **055** | 65 | 4.10 | 163 | 616.1 |

## START-UP AND OPERATION

NOTE: Refer to Start-Up Checklist on pages CL-1 to CL-8.

**Actual Start-Up —** Actual start-up should be done only under supervision of a qualified refrigeration mechanic.

1. Be sure all service valves are open.
2. Using the Scrolling Marquee display, set leaving-fluid set point (CSP.1) [Set Point, COOL]. No cooling range adjustment is necessary.
3. Start chilled fluid pump (if not configured for cooler pump control).
4. Turn ENABLE/OFF/REMOTE CONTACT switch to ENABLE position.

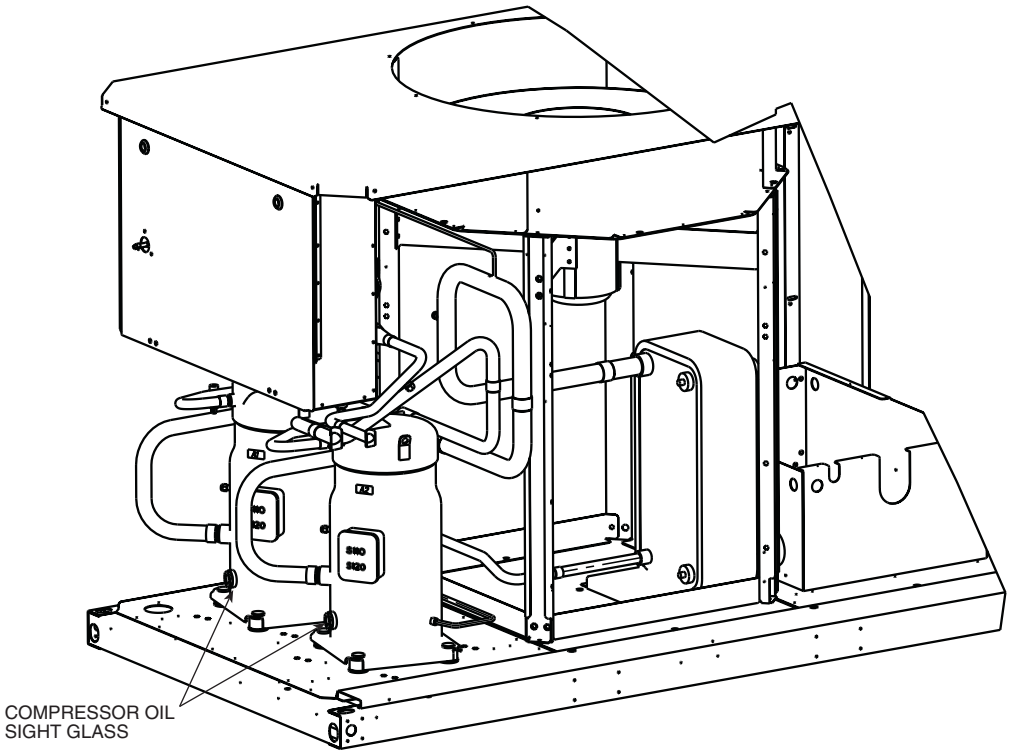



**Fig. 39 — Compressor Connections and Oil Sight Glass Location**

5. Allow unit to operate and confirm that everything is functioning properly. Check to see that leaving fluid temperature agrees with leaving set point (CSP.1 or CSP.2), or if reset is used, with the control point (CTPT) [Run Status, VIEW].
6. Check the cooler leaving chilled water temperature to see that it remains well above 32 F (0° C), or the brine freezing point if the unit is a medium temperature brine unit.
7. Recheck compressor oil level (see Check Oil Charge section).

**Check Refrigerant Charge —** All 30RA units are shipped with a complete operating charge of R-22 and should be under sufficient pressure to conduct a leak test after installation. If there is no system pressure, admit nitrogen until a pressure is observed and then proceed to test for leaks. After leaks are repaired, the system must be dehydrated.

All refrigerant charging should be done through the ¼-in. Schraeder connection on the liquid line. Do NOT add refrigerant charge through the low-pressure side of the system. If complete charging is required, weigh in the appropriate charge for the circuit as shown on the unit nameplate. If partial charging is required, operate circuit at full load and use an accurate temperature sensor on the liquid line as it enters the TXV. Use the Temperatures mode on the Scrolling Marquee display to show the circuit saturated condensing temperature (SCT.A or SCT.B). Charging is most accurate at saturated discharge temperatures of 120 to 125 F (49 to 52 C). Block condenser airflow as required to reach this temperature range. Add refrigerant until the system subcooling (SCT.A or SCT.B minus liquid line temperature entering TXV) is approximately 15 to 17 F (–9.4 to –8.3 C). Refrigerant VAPOR only may be added to a circuit through the $^1/_4$-in. suction Schraeder connection on the compressor. This connection is located in line and to the left of the compressor junction box for the SM110 compressors and to the lower right of the compressor junction box for all other compressor models.

**⚠ CAUTION**

Never charge liquid into low-pressure side of system. Do not overcharge. Overcharging results in higher discharge pressure, possible compressor damage, and higher power consumption. During charging or removal of refrigerant, be sure water is continuously circulating through the cooler to prevent freezing. Damage caused by freezing is considered abuse and may void the Sterling warranty.

## Operating Limitations

TEMPERATURES (See Table 41 for 30RA Standard Temperature Limits)

**⚠ CAUTION**

Do not operate with cooler leaving chiller water (fluid) temperature (LCWT) below 40 F (4.4 C) for the standard units, or below 15 F (–9.4 C) for units factory built for medium temperature brine.

High Cooler Leaving Chilled Water (Fluid) Temperatures (LCWT) — During start-up with cooler LCWT above approximately 60 F (16 C), the unit expansion valve will limit suction pressure to approximately 90 psig (620 kPa) to avoid overloading the compressor.

Low Cooler LCWT — For standard units, the LCWT must be no lower than 40 F (4.4 C). If the unit is the factory-installed optional medium temperature brine unit, the cooler LCWT can go down to 15 F (–9.4 C).

**Table 41 — Temperature Limits for Standard 30RA Units**

| UNIT SIZE 30RA | 010-030 | | 032-055 | |
|---|---|---|---|---|
| Temperature | F | C | F | C |
| Maximum Ambient Temperature | 120 | 49 | 120 | 49 |
| Minimum Ambient Temperature | 45 | 7 | 32 | 0 |
| Maximum Cooler EWT* | 95 | 35 | 95 | 35 |
| Maximum Cooler LWT | 70 | 21 | 70 | 21 |
| Minimum Cooler LWT† | 40 | 4.4 | 40 | 4.4 |

LEGEND

**EWT** — Entering Fluid (Water) Temperature
**LWT** — Leaving Fluid (Water) Temperature

*For sustained operation, EWT should not exceed 85 F (29.4 C).
†Unit requires modification below this temperature.

LOW-AMBIENT OPERATION — If operating temperatures below 45 F (7 C) for sizes 010-030 or below 32 F (0° C) for sizes 032-055 are expected, accessory Motormaster® V control must be installed. Refer to separate installation instructions for operation using this accessory. Contact your Sterling representative for details.

**⚠ CAUTION**

Brine duty application (below 40 F [4.4 C] LCWT) for chiller normally requires factory modification. Contact your Sterling representative for applicable LCWT range for standard water-cooled chiller in a specific application.

VOLTAGE — ALL UNITS

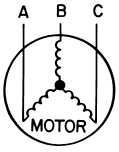
Main Power Supply — Minimum and maximum acceptable supply voltages are listed in the Installation Instructions.

*Unbalanced 3-Phase Supply Voltage — Never operate a motor where a phase imbalance between phases is greater than 2%.* To determine percent voltage imbalance:

$$\% \text{ Voltage Imbalance} = 100 \times \frac{\text{max voltage deviation from avg voltage}}{\text{average voltage}}$$

The maximum voltage deviation is the largest difference between a voltage measurement across 2 legs and the average across all 3 legs.

Example: Supply voltage is 240-3-60.




AB = 243 v
BC = 236 v
AC = 238 v

1. Determine average voltage:

$$\text{Average voltage} = \frac{243 + 236 + 238}{3}$$

$$= \frac{717}{3}$$

$$= 239$$

2. Determine maximum deviation from average voltage:
   (AB) 243 – 239 = 4 v
   (BC) 239 – 236 = 3 v
   (AC) 239 – 238 = 1 v
   Maximum deviation is 4 v.
3. Determine percent voltage imbalance:

$$\% \text{ Voltage Imbalance} = 100 \times \frac{4}{239}$$

$$= 1.7\%$$

This voltage imbalance is satisfactory as it is below the maximum allowable of 2%.

IMPORTANT: If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately. Do not operate unit until imbalance condition is corrected.

Control Circuit Power — Power for the control circuit is supplied from the main incoming power through a factory-installed control power transformer (TRAN1) for all models. Field wiring connections are made to either terminal block TB5 or TB6.

## OPERATION SEQUENCE

During unit off cycle, the control monitors the outdoor air temperature. If the ambient temperature drops below 40 F (4.4 C), cooler and hydronic system heaters (if either are factory installed) are energized. If power is maintained to the chiller and the EMERGENCY ON/OFF switch is left in the OFF position, these heaters are also energized.

The unit is started by putting the ENABLE/OFF/REMOTE CONTACT switch in the ENABLE or REMOTE CONTACT position. When the unit receives a call for cooling (either from the internal control or SCN network command or remote contact closure), the unit stages up in capacity to maintain the leaving fluid set point. The first compressor starts $1^1/_2$ to 3 minutes after the call for cooling.

The lead circuit can be specifically designated on all models or selected based on compressor run hours and starts depending on field configuration. The unit control will override this selection under certain starting conditions to properly maintain oil return to the compressors. In general, on dual compressor circuits, the control will most often start the A1 or B1 compressor first, especially after long off periods. The MBB controls fan stages to maintain the head pressure set point and will automatically adjust unit capacity as required to keep compressors from operating outside of the specified envelope. There are no pumpout or pumpdown sequences on these chillers.

For all units, if temperature reset is being used, the unit controls to a higher leaving-fluid temperature as the building load reduces. If demand limit is used, the unit may temporarily be unable to maintain the desired leaving-fluid temperature because of imposed power limitations. Loading sequence for compressors is shown in Tables 6 and 7.

# APPENDIX A

## SCN Tables

### A_UNIT (General Unit Parameters)

| DESCRIPTION | VALUE | UNITS | POINT NAME | FORCEABLE |
|---|---|---|---|---|
| Control Mode | 0 = Test<br>1 = Local Off<br>2 = SCN Off<br>3 = Clock Off<br>4 = Emergency Stop<br>5 = Local On<br>6 = SCN On<br>7 = Clock On<br>8 = Heat Enabled<br>9 = Pump Delay | | STAT | N |
| Occupied | No/Yes | | OCC | N |
| SCN Chiller | Start/Stop | | CHIL_S_S | Y |
| Low Sound Active | No/Yes | | LSACTIVE | N |
| Alarm State | Normal/Alert/Alarm | | ALM | N |
| Active Demand Limit | 0 to 100 | % | DEM_LIM | Y |
| Override Modes in Effect | No/Yes | | MODE | N |
| Percent Total Capacity | 0 to 100 | % | CAP_T | N |
| Requested Stage | 0 to 99 | | STAGE | N |
| Active Set Point | –20 to 70 | °F | SP | N |
| Control Point | –20 to 70 | °F | CTRL_PNT | Y |
| Entering Fluid Temp | snnn.n | °F | EWT | N |
| Leaving Fluid Temp | snnn.n | °F | LWT | N |
| Emergency Stop | Enable/Emstop | Enable | EMSTOP | Y |
| Minutes Left for Start | 00:00 to 15:00 | minutes | MIN_LEFT | N |
| PUMPS | | | | |
| Cooler Pump Relay 1 | Off/On | | COOLPMP1 | N |
| Cooler Pump Relay 2 | Off/On | | COOLPMP2 | N |
| Cooler Pump 1 Interlock | Open/Close | | PMP1_FBK | N |
| Cooler Pump 2 Interlock | Open/Close | | PMP2_FBK | N |
| Cooler Flow Switch | Open/Close | | COOLFLOW | N |
| Rotate Cooler Pumps Now | No/Yes | | ROT_PUMP | |
| | | | | |
| Heat/Cool Select | Heat/Cool | | HC_SEL | N |

### CIRCADIO (Circuit A Discrete Inputs/Outputs)

| DESCRIPTION | VALUE | UNITS | POINT NAME | FORCEABLE |
|---|---|---|---|---|
| CIRC. A DISCRETE OUTPUTS | | | | |
| Compressor A1 Relay | On/Off | | K_A1_RLY | N |
| Compressor A2 Relay | On/Off | | K_A2_RLY | N |
| Minimum Load Valve Relay | On/Off | | MLV_RLY | N |
| | | | | |
| CIRC. A DISCRETE INPUTS | | | | |
| Compressor A1 Feedback | On/Off | | K_A1_FBK | N |
| Compressor A2 Feedback | On/Off | | K_A2_FBK | N |

### CIRCA_AN (Circuit A Analog Parameters)

| DESCRIPTION | VALUE | UNITS | POINT NAME | FORCEABLE |
|---|---|---|---|---|
| CIRCUIT A ANALOG VALUES | | | | |
| Percent Total Capacity | 0-100 | % | CAPA_T | N |
| Percent Available Cap. | 0-100 | % | CAPA_A | N |
| Discharge Pressure | nnn.n | PSIG | DP_A | N |
| Suction Pressure | nnn.n | PSIG | SP_A | N |
| Calculated HP Setpoint A | nnn.n | °F | HSP_A | N |
| Saturated Condensing Tmp | snnn.n | °F | TMP_SCTA | N |
| Saturated Suction Temp | snnn.n | °F | TMP_SSTA | N |
| Compr Return Gas Temp | snnn.n | °F | TMP_RGTA | N |
| Suction Superheat Temp | snnn.n | ΔF | SH_A | N |

## CIRCBDIO (Circuit B Discrete Inputs/Outputs)

| DESCRIPTION | VALUE | UNITS | POINT NAME | FORCEABLE |
|---|---|---|---|---|
| CIRC. B DISCRETE OUTPUTS | | | | |
| Compressor B1 Relay | On/Off | | K_B1_RLY | N |
| Compressor B2 Relay | On/Off | | K_B2_RLY | N |
| Minimum Load Valve Relay | On/Off | | MLV_RLY | N |
| | | | | |
| CIRC. B DISCRETE INPUTS | | | | |
| Compressor B1 Feedback | On/Off | | K_B1_FBK | N |
| Compressor B2 Feedback | On/Off | | K_B2_FBK | N |

## CIRCB_AN (Circuit B Analog Parameters)

| DESCRIPTION | VALUE | UNITS | POINT NAME | FORCEABLE |
|---|---|---|---|---|
| CIRCUIT B ANALOG VALUES | | | | |
| Percent Total Capacity | 0-100 | % | CAPB_T | N |
| Percent Available Cap. | 0-100 | % | CAPB_A | N |
| Discharge Pressure | nnn.n | PSIG | DP_B | N |
| Suction Pressure | nnn.n | PSIG | SP_B | N |
| Calculated HP Setpoint B | nnn.n | °F | HSP_B | N |
| Saturated Condensing Tmp | snnn.n | °F | TMP_SCTB | N |
| Saturated Suction Temp | snnn.n | °F | TMP_SSTB | N |
| Compr Return Gas Temp | snnn.n | °F | TMP_RGTB | N |
| Suction Superheat Temp | snnn.n | ΔF | SH_B | N |

## OPTIONS (Unit Parameters)

| DESCRIPTION | VALUE | UNITS | POINT NAME | FORCEABLE |
|---|---|---|---|---|
| FANS | | | | |
| Fan 1 Relay | Off/On | | FAN_1 | N |
| Fan 2 Relay | Off/On | | FAN_2 | N |
| Cooler/Pump Heater | Off/On | | COOL_HTR | N |
| | | | | |
| UNIT ANALOG VALUES | | | | |
| Cooler Entering Fluid | snnn.n | °F | COOL_EWT | N |
| Cooler Leaving Fluid | snnn.n | °F | COOL_LWT | N |
| Lead/Lag Leaving Fluid | snnn.n | °F | DUAL_LWT | N |
| | | | | |
| TEMPERATURE RESET | | | | |
| 4-20 mA Reset Signal | nn.n | mA | RST_MA | N |
| Outside Air Temperature | snnn.n | °F | OAT | Y |
| Space Temperature | snnn.n | °F | SPT | Y |
| | | | | |
| DEMAND LIMIT | | | | |
| 4-20 mA Demand Signal | nn.n | mA | LMT_MA | N |
| Demand Limit Switch 1 | Off/On | | DMD_SW1 | N |
| Demand Limit Switch 2 | Off/On | | DMD_SW2 | N |
| SCN Loadshed Signal | 0 = Normal<br>1 = Redline<br>2 = Loadshed | | DL_STAT | N |
| | | | | |
| MISCELLANEOUS | | | | |
| Heat Request | Off/On | | HEAT_REQ | N |
| Dual Setpoint Switch | Off/On | | DUAL_IN | N |
| Cooler LWT Setpoint | snnn.n | °F | LWT_SP | N |
| Ice Done | Off/On | | ICE_DONE | N |

## ALARMDEF (Alarm Definition Table)

| DESCRIPTION | VALUE | DEFAULT | UNITS | POINT NAME |
|---|---|---|---|---|
| Alarm Routing Control | 00000000 | 00000000 | | ALRM_CNT |
| Equipment Priority | 0 to 7 | 4 | | EQP_TYPE |
| Comm Failure Retry Time | 1 to 240 | 10 | min | RETRY_TM |
| Re-alarm Time | 1 to 255 | 30 | min | RE-ALARM |
| Alarm System Name | XXXXXXXX | CHILLER | | ALRM_NAM |

## BRODEFS (Broadcast POC Definition Table)

| DESCRIPTION | VALUE | DEFAULT | UNITS | POINT NAME |
|---|---|---|---|---|
| SCN Time/Date Broadcast | Yes/No | No | | SCNBC |
| SCN OAT Broadcast | Yes/No | No | | OATBC |
| Global Schedule Broadcast | Yes/No | No | | GSBC |
| SCN Broadcast Ack'er | Yes/No | No | | SCNBCACK |
| Daylight Savings Start: | | | | |
| Month | 1 to 12 | 4 | | STARTM |
| Week | 1 to 5 | 1 | | STARTW |
| Day | 1 to 7 | 7 | | STARTD |
| Minutes to Add | 0 to 99 | 60 | min | MINADD |
| Daylight Savings Stop | | | | |
| Month | 1 to 12 | 10 | | STOPM |
| Week | 1 to 5 | 5 | | STOPW |
| Day | 1 to 7 | 7 | | STOPD |
| Minutes to Subtract | 0 to 99 | 60 | min | MINSUB |

## DISPLAY (Marquee Display SETUP)

| DESCRIPTION | VALUE | DEFAULT | UNITS | POINT NAME |
|---|---|---|---|---|
| Service Password | nnnn | 1111 | | PASSWORD |
| Password Enable | Enable/Disable | Enable | | PASS_EBL |
| Metric Display | Off/On | Off | | DISPUNIT |
| Language Selection | 0 = ENGLISH<br>1 = FRANCAIS<br>2 = ESPANOL<br>3 = PORTUGUES | 0 | | LANGUAGE |

## DUALCHIL (Dual Chiller Configuration Settings)

| DESCRIPTION | VALUE | DEFAULT | UNITS | POINT NAME |
|---|---|---|---|---|
| LEAD/LAG | | | | |
| Lead/Lag Chiller Enable | Enable/Dsable | Dsable | | LL_ENA |
| Master/Slave Select | Master/Slave | Master | | MS_SEL |
| Slave Address | 0 to 239 | 2 | | SLV_ADDR |
| Lead/Lag Balance Select | 0 = None | 0 | | LL_BAL |
| Lead/Lag Balance Delta | 40 to 400 | 168 | hours | LL_BAL_D |
| Lag Start Delay | 0 to 30 | 5 | minutes | LL_DELAY |
| Parallel Configuration | Yes | Yes | | PARALLEL |

## OPTIONS1 (Options 1 Configuration)

| DESCRIPTION | VALUE | DEFAULT | UNITS | POINT NAME |
|---|---|---|---|---|
| Cooler Fluid | 1 = Water<br>2 = Med. Brine | 1 | | FLUIDTYP |
| Minimum Load Vlv Select | No/Yes | No | | MLV_FLG |
| Return Gas Sensor Enable | Dsable/Enable | Dsable | | RGT_ENA |
| Motormaster Select | No/Yes | No | | MTR_TYPE |
| Cooler Pump Control | Off/On | Off | | CPC |
| Cooler Pump 1 Enable | No/Yes | No | | PMP1_ENA |
| Cooler Pump 2 Enable | Dsable/Enable | Dsable | | PMP2_ENA |
| Cooler Pmp Periodic Strt | No/Yes | No | | PUMP_PST |
| Cooler Pump Select | 0 = Automatic<br>1 = Pump 1<br>2 = Pump 2 | 0 | | PMP_SLCT |
| Cooler Pump Shutdown Dly | 0 to 10 | 1 | minutes | PUMP_DLY |
| Pump Changeover Hours | 10 to 2000 | 500 | hours | PMP_DLTA |
| EMM Module Installed | No/Yes | No | | EMM_BRD |

## OPTIONS2 (Options 2 Configuration)

| DESCRIPTION | VALUE | DEFAULT | UNITS | POINT NAME |
|---|---|---|---|---|
| Control Method | 0 = Switch<br>2 = Occupancy<br>3 = SCN | 0 | | CONTROL |
| Loading Sequence Select | 1 = Equal Loading<br>2 = Staged Loading | 1 | | SEQ_TYP |
| Lead/Lag Circuit Select | 0 = Automatic<br>1 = Circuit A Leads<br>2 = Circuit B Leads | 0 | | LEAD_TYP |
| Cooling Setpoint Select | 0 = Single<br>1 = Dual, remote switch controlled<br>2 = Dual SCN occupancy<br>3 = 4-20 mA input | 0 | | CLSP_TYP |
| Ramp Load Select | Enable/Dsable | Enable | | RAMP_EBL |
| Heat Cool Select | Cool/Heat | Cool | | HEATCOOL |
| High LCW Alert Limit | 2 to 60 | 60.0 | ΔF | LCW_LMT |
| Minutes off time | 0 to 15 | 0 | min | DELAY |
| Deadband Multiplier | 1.0 to 4.0 | 2.0 | | Z_GAIN |
| Ice Mode Enable | Enable/Dsable | Dsable | | ICE_CNFG |
| Close Control Select | Enable/Dsable | Dsable | | CLS_CTRL |
| Low Sound Mode Select | 0 = Disabled<br>1 = Fan only<br>2 = Capacity/Fans | 1 | | LS_MODE |
| Low Sound Start Time | 00:00 to 23:59 | 00:00 | | LS_START |
| Low Sound End Time | 00:00 to 23:59 | 00:00 | | LS_END |
| Low Sound Capacity Limit | 0 to 100 | 100 | % | LS_LIMIT |
| Enable Short Loop Gain | Enable/Dsable | Enable | | SAGENABL |

## RESETCON (Temperature Reset and Demand Limit)

| DESCRIPTION | VALUE | DEFAULT | UNITS | POINT NAME |
|---|---|---|---|---|
| COOLING RESET | | | | |
| Cooling Reset Type | 0 = No Reset<br>1 = 4-20 mA input<br>2 = External temp – OAT<br>3 = Return Fluid<br>4 = External temp - SPT | 0 | | CRST_TYP |
| 4-20 MA RESET | | | | |
| 4-20 – Degrees Reset | –30 to 30 | 0.0 | ΔF | 420_DEG |
| | | | | |
| REMOTE RESET | | | | |
| Remote – No Reset Temp | 0 to 125 | 125.0 | °F | REM_NO |
| Remote – Full Reset Temp | 0 to 125 | 0.0 | °F | REM_FULL |
| Remote – Degrees Reset | –30 to 30 | 0.0 | ΔF | REM_DEG |
| | | | | |
| RETURN TEMPERATURE RESET | | | | |
| Return – No Reset Temp | 0 to 125 | 10.0 | ΔF | RTN_NO |
| Return – Full Reset Temp | 0 to 125 | 0.0 | ΔF | RTN_FULL |
| Return – Degrees Reset | –30 to 30 | 0.0 | ΔF | RTN_DEG |
| | | | | |
| DEMAND LIMIT | | | | |
| Demand Limit Select | 0 = None<br>1 = External switch input<br>2 = 4-20 mA input<br>3 = Loadshed | 0 | | DMD_CTRL |
| Demand Limit at 20 mA | 0 to 100 | 100 | % | DMT20MA |
| Loadshed Group Number | 0 to 99 | 0 | | SHED_NUM |
| Loadshed Demand Delta | 0 to 60 | 0 | % | SHED_DEL |
| Maximum Loadshed Time | 0 to 120 | 60 | minutes | SHED_TIM |
| Demand Limit Switch 1 | 0 to 100 | 80 | % | DLSWSP1 |
| Demand Limit Switch 2 | 0 to 100 | 50 | % | DLSWSP2 |

## SCHEDOVR (Timed Override Setup)

| DESCRIPTION | VALUE | DEFAULT | UNITS | POINT NAME |
|---|---|---|---|---|
| Schedule Number | 0 to 99 | 1 | | SCHEDNUM |
| Override Time Limit | 0 to 4 | 0 | hours | OTL |
| Timed Override Hours | 0 to 4 | 0 | hours | OVR_EXT |
| Timed Override | No/Yes | No | | TIMEOVER |

## SETPOINT

| DESCRIPTION | VALUE | DEFAULT | UNITS | POINT NAME |
|---|---|---|---|---|
| COOLING | | | | |
| Cooling Setpoint 1 | –20 to 70 | 44.0 | °F | CSP1 |
| Cooling Setpoint 2 | –20 to 70 | 44.0 | °F | CSP2 |
| ICE Setpoint | –20 to 32 | 32.0 | °F | CSP3 |
| | | | | |
| RAMP LOADING | | | | |
| Cooling Ramp Loading | 0.2 to 2.0 | 1.0 | | CRAMP |
| | | | | |
| Brine Freeze Point | –20 to 34 | 34.0 | °F | BRN_FRZ |

## UNIT

| DESCRIPTION | VALUE | DEFAULT | UNITS | POINT NAME |
|---|---|---|---|---|
| Compressor A1 Size | 8 to 15 | **60 Hz:** 010-10; 015-15; 018-9; 022-9; 025-13; 030-15; 035-9; 040-13; 045-10; 050-13; 055-15<br>**50 Hz:** 010-11; 015-7; 018-9; 022-11; 025-13; 032-8; 035-13; 042-11; 045-13 | | SIZE_A1 |
| Compressor A2 Size | 0 to 15 | **60 Hz:** 018-9; 022-13; 025-13; 030-15; 035-13; 040-13;<br>045-13; 050-13; 055-15<br>**50 Hz:** 015-7; 018-9; 022-11; 025-13; 032-11; 035-13; 042-11; 045-13 | | SIZE_A2 |
| Compressor B1 Size | 0 to 15 | **60 Hz:** 035-15; 040-15; 045-10; 050-13; 055-15<br>**50 Hz:** 032-13; 035-13; 042-11; 045-13 | | SIZE_B1 |
| Compressor B2 Size | 0 to 15 | **60 Hz**: 045-13; 050-13; 055-15<br>**50 Hz:** 042-11; 045-13 | | SIZE_B2 |
| Suction Superheat Setpt | 10 to 40 | 15 | | SH_SP |
| Refrigerant | 1 = R22 | 1 | | REFRIG_T |
| Fan Staging Select | 1 = 1 Fan<br>2 = 2 Fans<br>3 = 3 Fans<br>4 = 4 Fans | 1 = One Fan (010-018)<br>2 = Two Fans (022-030)<br>3 = Three Fans (032-040)<br>4 = Four Fans (042-055) | | FAN_TYPE |

# MAINTENANCE

## ALARMS: Maintenance Display

| DESCRIPTION | VALUE | POINT NAME |
|---|---|---|
| Active Alarm #1 | Axxx or Txxx | ALARM01C |
| Active Alarm #2 | Axxx or Txxx | ALARM02C |
| Active Alarm #3 | Axxx or Txxx | ALARM03C |
| Active Alarm #4 | Axxx or Txxx | ALARM04C |
| Active Alarm #5 | Axxx or Txxx | ALARM05C |
| Active Alarm #6 | Axxx or Txxx | ALARM06C |
| Active Alarm #7 | Axxx or Txxx | ALARM07C |
| Active Alarm #8 | Axxx or Txxx | ALARM08C |
| Active Alarm #9 | Axxx or Txxx | ALARM09C |
| Active Alarm #10 | Axxx or Txxx | ALARM10C |
| Active Alarm #11 | Axxx or Txxx | ALARM11C |
| Active Alarm #12 | Axxx or Txxx | ALARM12C |
| Active Alarm #13 | Axxx or Txxx | ALARM13C |
| Active Alarm #14 | Axxx or Txxx | ALARM14C |
| Active Alarm #15 | Axxx or Txxx | ALARM15C |
| Active Alarm #16 | Axxx or Txxx | ALARM16C |
| Active Alarm #17 | Axxx or Txxx | ALARM17C |
| Active Alarm #18 | Axxx or Txxx | ALARM18C |
| Active Alarm #19 | Axxx or Txxx | ALARM19C |
| Active Alarm #20 | Axxx or Txxx | ALARM20C |
| Active Alarm #21 | Axxx or Txxx | ALARM21C |
| Active Alarm #22 | Axxx or Txxx | ALARM22C |
| Active Alarm #23 | Axxx or Txxx | ALARM23C |
| Active Alarm #24 | Axxx or Txxx | ALARM24C |
| Active Alarm #25 | Axxx or Txxx | ALARM25C |

## CURRMODS: Maintenance Display

| DESCRIPTION | VALUE | POINT NAME |
|---|---|---|
| FSM controlling Chiller | On/Off | MODE_1 |
| WSM controlling Chiller | On/Off | MODE_2 |
| Master/Slave control | On/Off | MODE_3 |
| Ramp Load Limited | On/Off | MODE_5 |
| Timed Override in effect | On/Off | MODE_6 |
| Low Cooler Suction TempA | On/Off | MODE_7 |
| Low Cooler Suction TempB | On/Off | MODE_8 |
| Slow Change Override | On/Off | MODE_9 |
| Minimum OFF time active | On/Off | MODE_10 |
| Dual Setpoint | On/Off | MODE_13 |
| Temperature Reset | On/Off | MODE_14 |
| Demand/Sound Limited | On/Off | MODE_15 |
| Cooler Freeze Protection | On/Off | MODE_16 |
| Low Temperature Cooling | On/Off | MODE_17 |
| High Temperature Cooling | On/Off | MODE_18 |
| Making ICE | On/Off | MODE_19 |
| Storing ICE | On/Off | MODE_20 |
| High SCT Circuit A | On/Off | MODE_21 |
| High SCT Circuit B | On/Off | MODE_22 |
| Minimum Comp. On Time | On/Off | MODE_23 |
| Pump Off Delay Time | On/Off | MODE_24 |
| Low Sound Mode | On/Off | MODE_25 |
| Short Loop Override | On/Off | MODE_26 |

## DUALCHIL: Maintenance Display

| DESCRIPTION | VALUE | UNITS | POINT NAME |
|---|---|---|---|
| Dual Chiller Link Good? | Yes/No | | DC_LINK |
| Master Chiller Role | Stand Alone, Lead Chiller, Lag Chiller | | MC_ROLE |
| Slave Chiller Role | Stand Alone, Lead Chiller, Lag Chiller | | SC_ROLE |
| Lead Chiller Ctrl Point | snnn.n | °F | LEAD_CP |
| Lag Chiller Ctrl Point | snnn.n | °F | LAG_CP |
| Control Point | snnn.n | °F | CTRL_PNT |
| Cool EnteringFluid-Slave | snnn.n | °F | COOLEWTS |
| Cool Leaving Fluid-Slave | snnn.n | °F | COOLLWTS |
| Cooler Entering Fluid | snnn.n | °F | COOL_EWT |
| Cooler Leaving Fluid | snnn.n | °F | COOL_LWT |
| Lead/Lag Leaving Fluid | snnn.n | °F | DUAL_LWT |
| Percent Avail.Capacity | 0-100 | % | CAP_A |
| Percent Avail.Cap.Slave | 0-100 | % | CAP_A_S |
| Lag Start Delay Time | hh:mm | | LAGDELAY |
| Load/Unload Factor | snnn.n | | SMZ |
| Load/Unload Factor-Slave | snnn.n | | SMZSLAVE |
| Lead SMZ Clear Commanded | Yes/No | | LEADSMZC |
| Lag- SMZ Clear Commanded | Yes/No | | LAG_SMZC |
| Lag Commanded Off? | Yes/No | | LAG_OFF |
| Dual Chill Lead CapLimit | 0-100 | % | DCLDCAPL |
| Dual Chill Lag CapLimit | 0-100 | % | DCLGCAPL |

## LEARNFNS: Maintenance Display

| DESCRIPTION | VALUE | UNITS | POINT NAME |
|---|---|---|---|
| Fan 1 Delta SCT point 1 | snnn.n | °F | F1DLTA1 |
| Fan 1 Delta SCT point 2 | snnn.n | °F | F1DLTA2 |
| Fan 1 Delta SCT point 3 | snnn.n | °F | F1DLTA3 |
| Fan 1 Delta SCT point 4 | snnn.n | °F | F1DLTA4 |
| Fan 1 Delta SCT point 5 | snnn.n | °F | F1DLTA5 |
| Fan 2 Delta SCT point 1 | snnn.n | °F | F2DLTA1 |
| Fan 2 Delta SCT point 2 | snnn.n | °F | F2DLTA2 |
| Fan 2 Delta SCT point 3 | snnn.n | °F | F2DLTA3 |
| Fan 2 Delta SCT point 4 | snnn.n | °F | F2DLTA4 |
| Fan 2 Delta SCT point 5 | snnn.n | °F | F2DLTA5 |
| SCT Delta for Comp A1 | snnn.n | °F | A1SCTDT |
| SCT Delta for Comp A2 | snnn.n | °F | A2SCTDT |
| SCT Delta for Comp B1 | snnn.n | °F | B1SCTDT |
| SCT Delta for Comp B2 | snnn.n | °F | B2SCTDT |
| SAGP for Compressor A1 | nn.n | | SAGA1P |
| SAGM for Compressor A1 | nn.n | | SAGA1M |
| SAGP for Compressor A2 | nn.n | | SAGA2P |
| SAGM for Compressor A2 | nn.n | | SAGA2M |
| SAGP for Compressor B1 | nn.n | | SAGB1P |
| SAGM for Compressor B1 | nn.n | | SAGB1M |
| SAGP for Compressor B2 | nn.n | | SAGB2P |
| SAGM for Compressor B2 | nn.n | | SAGB2M |

## LOADFACT: Maintenance Display

| DESCRIPTION | VALUE | UNITS | POINT NAME |
|---|---|---|---|
| CAPACITY CONTROL | | | |
| Load/Unload Factor | snnn.n | | SMZ |
| Control Point | snnn.n | °F | CTRL_PNT |
| Entering Fluid Temp | snnn.n | °F | EWT |
| Leaving Fluid Temp | snnn.n | °F | LWT |
| | | | |
| Ramp Load Limited | On/Off | | MODE_5 |
| Slow Change Override | On/Off | | MODE_9 |
| Cooler Freeze Protection | On/Off | | MODE_16 |
| Low Temperature Cooling | On/Off | | MODE_17 |
| High Temperature Cooling | On/Off | | MODE_18 |
| Minimum Comp. On Time | On/Off | | MODE_23 |

## OCCUPANCY SUPERVISORY (OCCDEFM): Maintenance Display

| DESCRIPTION | VALUE | POINT NAME |
|---|---|---|
| Current Mode (1=Occup.) | 0/1 | MODE |
| Current Occup. Period # | 0-8 | PER-NO |
| Timed-Override in Effect | Yes/No | OVERLAST |
| Time-Override Duration | 0-4 hours | OVR_HRS |
| Current Occupied Time | hh:mm | STRTTIME |
| Current Unoccupied Time | hh:mm | ENDTIME |
| Next Occupied Day | | NXTOCDAY |
| Next Occupied Time | hh:mm | NXTOCTIM |
| Next Unoccupied Day | | NXTUNDAY |
| Next Unoccupied Time | hh:mm | NXTUNTIM |
| Previous Unoccupied Day | | PRVUNDAY |
| Previous Unoccupied Time | hh:mm | PRVUNTIM |

## PM-COIL: Maintenance Display

| DESCRIPTION | VALUE | UNITS | POINT NAME |
|---|---|---|---|
| Coil Cleaning Srvc Inter | nnnnnn | hours | SI_COIL |
| Coil Service Countdown | nnnnnn | hours | CL_CDOWN |
| Coil Cleaning Maint.Done | Yes/No | | CL_MAINT |
| Coil Cleaning Maint.Date | mm/dd/yy hh:mm | | COIL_PM0 |
| Coil Cleaning Maint.Date | mm/dd/yy hh:mm | | COIL_PM1 |
| Coil Cleaning Maint.Date | mm/dd/yy hh:mm | | COIL_PM2 |
| Coil Cleaning Maint.Date | mm/dd/yy hh:mm | | COIL_PM3 |
| Coil Cleaning Maint.Date | mm/dd/yy hh:mm | | COIL_PM4 |

## PM-PUMP: Maintenance Display

| DESCRIPTION | VALUE | UNITS | POINT NAME |
|---|---|---|---|
| Pump Service Interval | nnnnnn | hours | SI_PUMPS |
| Pump 1 Service Countdown | nnnnnn | hours | P1_CDOWN |
| Pump 1 Maintenance Done | Yes/No | | P1_MAINT |
| Pump 2 Service Countdown | nnnnnn | hours | P2_CDOWN |
| Pump 2 Maintenance Done | Yes/No | | P2_MAINT |
| Pump 1 Maintenance Date | mm/dd/yy hh:mm | | PMP1_PM0 |
| Pump 1 Maintenance Date | mm/dd/yy hh:mm | | PMP1_PM1 |
| Pump 1 Maintenance Date | mm/dd/yy hh:mm | | PMP1_PM2 |
| Pump 1 Maintenance Date | mm/dd/yy hh:mm | | PMP1_PM3 |
| Pump 1 Maintenance Date | mm/dd/yy hh:mm | | PMP1_PM4 |
| Pump 2 Maintenance Date | mm/dd/yy hh:mm | | PMP2_PM0 |
| Pump 2 Maintenance Date | mm/dd/yy hh:mm | | PMP2_PM1 |
| Pump 2 Maintenance Date | mm/dd/yy hh:mm | | PMP2_PM2 |
| Pump 2 Maintenance Date | mm/dd/yy hh:mm | | PMP2_PM3 |
| Pump 2 Maintenance Date | mm/dd/yy hh:mm | | PMP2_PM4 |

## PM-STRN: Maintenance Display

| DESCRIPTION | VALUE | UNITS | POINT NAME |
|---|---|---|---|
| Strainer Srvc Interval | nnnnnn | hours | SI_STRNR |
| Strainer Srvc Countdown | nnnnnn | hours | ST_CDOWN |
| Strainer Maint. Done | Yes/No | | ST_MAINT |
| Strainer Maint. Date | mm/dd/yy hh:mm | | STRN_PM0 |
| Strainer Maint. Date | mm/dd/yy hh:mm | | STRN_PM1 |
| Strainer Maint. Date | mm/dd/yy hh:mm | | STRN_PM2 |
| Strainer Maint. Date | mm/dd/yy hh:mm | | STRN_PM3 |
| Strainer Maint. Date | mm/dd/yy hh:mm | | STRN_PM4 |

## RUNTEST: Maintenance Display

| DESCRIPTION | VALUE | UNITS | POINT NAME |
|---|---|---|---|
| Percent Total Capacity | nnn | % | CAPA_T |
| Percent Available Cap. | nnn | % | CAPA_A |
| Discharge Pressure | nnn.n | psig | DP_A |
| Suction Pressure | nnn.n | psig | SP_A |
| Calculated HP Setpoint A | nnn.n | °F | HSP_A |
| Saturated Condensing Tmp | nnn.n | °F | TMP_SCTA |
| Saturated Suction Temp | nnn.n | °F | TMP_SSTA |
| Compr Return Gas Temp | nnn.n | °F | TMP_RGTA |
| Suction Superheat Temp | nnn.n | ^F | SH_A |
| Compressor A1 Relay | On/Off | | K_A1_RLY |
| Compressor A2 Relay | On/Off | | K_A2_RLY |
| Minimum Load Valve Relay | On/Off | | MLV_RLY |
| Compressor A1 Feedback | On/Off | | K_A1_FBK |
| Compressor A2 Feedback | On/Off | | K_A2_FBK |
| Percent Total Capacity | nnn | % | CAPB_T |
| Percent Available Cap. | nnn | % | CAPB_A |
| Discharge Pressure | nnn.n | psig | DP_B |
| Suction Pressure | nnn.n | psig | SP_B |
| Calculated HP Setpoint B | nnn.n | °F | HSP_B |
| Saturated Condensing Tmp | nnn.n | °F | TMP_SCTB |
| Saturated Suction Temp | nnn.n | °F | TMP_SSTB |
| Compr Return Gas Temp | nnn.n | °F | TMP_RGTB |
| Suction Superheat Temp | nnn.n | ^F | SH_B |
| Compressor B1 Relay | On/Off | | K_B1_RLY |
| Compressor B2 Relay | On/Off | | K_B2_RLY |
| Minimum Load Valve Relay | On/Off | | MLV_RLY |
| | | | |
| Compressor B1 Feedback | On/Off | | K_B1_FBK |
| Compressor B2 Feedback | On/Off | | K_B2_FBK |
| Fan 1 Relay | On/Off | | FAN_1 |
| Fan 2 Relay | On/Off | | FAN_2 |
| | | | |
| Outside Air Temperature | nnn.n | °F | OAT |
| Space Temperature | nnn.n | °F | SPT |
| Cooler Pump Relay 1 | On/Off | | COOLPMP1 |
| Cooler Pump Relay 2 | On/Off | | COOLPMP2 |
| Cooler Pump 1 Interlock | Open/Closed | | PMP1_FBK |
| Cooler Pump 2 Interlock | Open/Closed | | PMP2_FBK |
| Cooler Entering Fluid | nnn.n | °F | COOL_EWT |
| Cooler Leaving Fluid | nnn.n | °F | COOL_LWT |
| Compressor A1 Size | nnn | tons | SIZE_A1 |
| Compressor A2 Size | nnn | tons | SIZE_A2 |
| Compressor B1 Size | nnn | tons | SIZE_B1 |
| Compressor B2 Size | nnn | tons | SIZE_B2 |
| Cooler Flow Switch | On/Off | | COOLFLOW |

## STRTHOUR: Maintenance Display

| DESCRIPTION | VALUE | UNITS | POINT NAME |
|---|---|---|---|
| Machine Operating Hours | nnnnnn | hours | HR_MACH |
| Machine Starts | nnnnnn | | CY_MACH |
| | | | |
| Circuit A Run Hours | nnnnnn | hours | HR_CIRA |
| Compressor A1 Run Hours | nnnnnn | hours | HR_A1 |
| Compressor A2 Run Hours | nnnnnn | hours | HR_A2 |
| Circuit B Run Hours | nnnnnn | hours | HR_CIRB |
| Compressor B1 Run Hours | nnnnnn | hours | HR_B1 |
| Compressor B2 Run Hours | nnnnnn | hours | HR_B2 |
| | | | |
| Circuit A Starts | nnnnnn | | CY_CIRA |
| Compressor A1 Starts | nnnnnn | | CY_A1 |
| Compressor A2 Starts | nnnnnn | | CY_A2 |
| Circuit B Starts | nnnnnn | | CY_CIRB |
| Compressor B1 Starts | nnnnnn | | CY_B1 |
| Compressor B2 Starts | nnnnnn | | CY_B2 |
| | | | |
| PUMP HOURS | | | |
| Pump 1 Run Hours | nnnnnn | hours | HR_PUMP1 |
| Pump 2 Run Hours | nnnnnn | hours | HR_PUMP2 |

## TESTMODE: Maintenance Display

| DESCRIPTION | VALUE | UNITS | POINT NAME |
|---|---|---|---|
| Service Test Mode | On/Off | | NET_CTRL |
| Compressor A1 Relay | On/Off | | S_A1_RLY |
| Compressor A2 Relay | On/Off | | S_A2_RLY |
| Compressor B1 Relay | On/Off | | S_B1_RLY |
| Compressor B2 Relay | On/Off | | S_B2_RLY |
| Fan 1 Relay | On/Off | | S_FAN_1 |
| Fan 2 Relay | On/Off | | S_FAN_2 |
| Cooler Pump Relay 1 | On/Off | | S_CLPMP1 |
| Cooler Pump Relay 2 | On/Off | | S_CLPMP2 |
| Minimum Load Valve Relay | On/Off | | S_MLV |
| Remote Alarm Relay | On/Off | | S_ALM |

## VERSIONS: Maintenance Display

| DESCRIPTION | VERSION | VALUE |
|---|---|---|
| MBB | CESR131279- | nn-nn |
| EMM | CESR131174- | nn-nn |
| MARQUEE | CESR131171- | nn-nn |
| NAVIGATOR | CESR130227- | nn-nn |

## WSMDEFME: Maintenance Display

| DESCRIPTION | VALUE | UNITS | POINT NAME |
|---|---|---|---|
| WSM Active? | Yes | | WSMSTAT |
| | | | |
| Chilled water temp | snn.n | °F | CHWTEMP |
| Equipment status | On | | CHLRST |
| | | | |
| Commanded state | Enable<br>Dsable<br>None | | CHLRENA |
| CHW setpoint reset value | nn.n | ^F | CHWRVAL |
| Current CHW setpoint | snn.n | °F | CHWSTPT |

# APPENDIX B

## FACTORY SETTINGS FOR COMPRESSOR, FAN, PUMP, AND MANUAL STARTERS

| UNIT SIZE 30RA | VOLTAGE V-PH-Hz | VOLTAGE SERIES | OVERLOAD RELAY (CA1) SETTING FOR COMPRESSOR A1 | OVERLOAD RELAY (CA2) SETTING FOR COMPRESSOR A2 | MANUAL STARTER SETTING FOR FANS FC-HS/LS | MANUAL STARTER SETTING FOR FANS FC-A1/A2 | MANUAL STARTER SETTING FOR CHC (Heaters) | MANUAL STARTER (CWP1, CWP2) SETTINGS FOR PUMP OPTIONS (Model Number Position 9) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | A/F | B/G | C/H | D/J | E/K |
| 010 | 575-3-60 | -100 | 15.5 | — | 3.6 | — | 1.8 | 1.9 | 2.5 | 2.5 | 3.6 | — |
| | 380-3-60 | -200 | 24.2 | — | 5.5 | — | 1.8 | 2.9 | 3.7 | 3.7 | 5.4 | — |
| | 230-3-60 | -400 | 37.1 | — | 9.1 | — | 2.5 | 4.8 | 6.2 | 6.2 | 8.9 | — |
| | 208/230-3-60 | -500 | 41.2 | — | 10.1 | — | 2.5 | 5.3 | 7.0 | 7.0 | 9.8 | — |
| | 460-3-60 | -600 | 19.2 | — | 4.6 | — | 1.8 | 2.8 | 3.1 | 3.1 | 4.4 | — |
| | 230-3-50 | -800 | 40.9 | — | 7.6 | — | 2.5 | 3.4 | 4.8 | 4.8 | 6.1 | — |
| | 380/415-3-50 | -900 | 23.8 | — | 4.6 | — | 1.8 | 2.0 | 2.9 | 2.9 | 3.7 | — |
| 015 | 575-3-60 | -100 | 22.7 | — | 3.6 | — | 1.8 | 1.9 | 2.5 | 2.5 | 3.6 | — |
| | 380-3-60 | -200 | 36.1 | — | 5.5 | — | 1.8 | 2.9 | 3.7 | 3.7 | 5.4 | — |
| | 230-3-60 | -400 | 52.6 | — | 9.1 | — | 2.5 | 4.8 | 6.2 | 6.2 | 8.9 | — |
| | 208/230-3-60 | -500 | 58.4 | — | 10.1 | — | 2.5 | 5.3 | 7.0 | 7.0 | 9.8 | — |
| | 460-3-60 | -600 | 28.6 | — | 4.6 | — | 1.8 | 2.8 | 3.1 | 3.1 | 4.4 | — |
| | 230-3-50 | -800 | 31.1 | 31.1 | 7.6 | — | 2.5 | 3.4 | 4.8 | 4.8 | 6.1 | — |
| | 380/415-3-50 | -900 | 17.2 | 17.2 | 4.6 | — | 1.8 | 2.0 | 2.9 | 2.9 | 3.7 | — |
| 018 | 575-3-60 | -100 | 13.6 | 13.6 | 3.6 | — | 1.8 | 1.9 | 2.5 | 2.5 | 3.6 | — |
| | 380-3-60 | -200 | 21 | 21 | 5.5 | — | 1.8 | 2.9 | 3.7 | 3.7 | 5.4 | — |
| | 230-3-60 | -400 | 31.9 | 31.9 | 9.1 | — | 2.5 | 4.8 | 6.2 | 6.2 | 8.9 | — |
| | 208/230-3-60 | -500 | 35.4 | 35.4 | 10.1 | — | 2.5 | 5.3 | 7.0 | 7.0 | 9.8 | — |
| | 460-3-60 | -600 | 16.9 | 16.9 | 4.6 | — | 1.8 | 2.8 | 3.1 | 3.1 | 4.4 | — |
| | 230-3-50 | -800 | 33.7 | 33.7 | 7.6 | — | 2.5 | 3.4 | 4.8 | 4.8 | 6.1 | — |
| | 380/415-3-50 | -900 | 18.7 | 18.7 | 4.6 | — | 1.8 | 2.0 | 2.9 | 2.9 | 3.7 | — |
| 022 | 575-3-60 | -100 | 14.6 | 19.9 | — | 2.3 | 1.8 | 1.9 | 2.5 | 2.5 | 3.6 | — |
| | 380-3-60 | -200 | 22.7 | 31.7 | — | 3.5 | 1.8 | 2.9 | 3.7 | 3.7 | 5.4 | — |
| | 230-3-60 | -400 | 35.3 | 44 | — | 5.8 | 2.5 | 4.8 | 6.2 | 6.2 | 8.9 | — |
| | 208/230-3-60 | -500 | 39.2 | 49 | — | 7.0 | 2.5 | 5.3 | 7.0 | 7.0 | 9.8 | — |
| | 460-3-60 | -600 | 17.5 | 24.2 | — | 2.9 | 1.8 | 2.8 | 3.1 | 3.1 | 4.4 | — |
| | 230-3-50 | -800 | 40.9 | 40.9 | — | 4.6 | 2.5 | 3.4 | 4.8 | 4.8 | 6.1 | — |
| | 380/415-3-50 | -900 | 23.8 | 23.8 | — | 3.7 | 1.8 | 2.0 | 2.9 | 2.9 | 3.7 | — |
| 025 | 575-3-60 | -100 | 19.9 | 19.9 | — | 2.3 | 1.8 | 1.9 | 2.5 | 2.5 | 3.6 | — |
| | 380-3-60 | -200 | 31.7 | 31.7 | — | 3.5 | 1.8 | 2.9 | 3.7 | 3.7 | 5.4 | — |
| | 230-3-60 | -400 | 44 | 44 | — | 5.8 | 2.5 | 4.8 | 6.2 | 6.2 | 8.9 | — |
| | 208/230-3-60 | -500 | 49 | 49 | — | 7.0 | 2.5 | 5.3 | 7.0 | 7.0 | 9.8 | — |
| | 460-3-60 | -600 | 24.2 | 24.2 | — | 2.9 | 1.8 | 2.8 | 3.1 | 3.1 | 4.4 | — |
| | 230-3-50 | -800 | 49.9 | 49.9 | — | 4.6 | 2.5 | 3.4 | 4.8 | 4.8 | 6.1 | — |
| | 380/415-3-50 | -900 | 29 | 29 | — | 3.7 | 1.8 | 2.0 | 2.9 | 2.9 | 3.7 | — |
| 030 | 575-3-60 | -100 | 22.7 | 22.7 | — | 2.3 | 1.8 | 1.9 | 2.5 | 2.5 | 3.6 | — |
| | 380-3-60 | -200 | 36.1 | 36.1 | — | 3.5 | 1.8 | 2.9 | 3.7 | 3.7 | 5.4 | — |
| | 230-3-60 | -400 | 52.6 | 52.6 | — | 5.8 | 2.5 | 4.8 | 6.2 | 6.2 | 8.9 | — |
| | 208/230-3-60 | -500 | 58.4 | 58.4 | — | 7.0 | 2.5 | 5.3 | 7.0 | 7.0 | 9.8 | — |
| | 460-3-60 | -600 | 28.6 | 28.6 | — | 2.9 | 1.8 | 2.8 | 3.1 | 3.1 | 4.4 | — |

## FACTORY SETTINGS FOR COMPRESSOR, FAN, PUMP, AND MANUAL STARTERS (cont)

| UNIT SIZE 30RA | VOLTAGE V-PH-Hz | VOLTAGE SERIES | OVERLOAD RELAY (CA1) SETTING FOR COMPRESSOR A1 | OVERLOAD RELAY (CA2) SETTING FOR COMPRESSOR A2 | OVERLOAD RELAY (CB1) SETTING FOR COMPRESSOR B1 | OVERLOAD RELAY (CB2) SETTING FOR COMPRESSOR B2 | MANUAL STARTER FOR FANS FC-HS/LS | MANUAL STARTER SETTING FOR FC-A1/A2 | MANUAL STARTER SETTING FOR CHC (Heaters) | MANUAL STARTER SETTINGS FOR PUMP OPTIONS (Model Number Position 9) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | A/F | B/G | C/H | D/J | E/K |
| 032 | 230-3-50 | -800 | 31.4 | 40.9 | 49.9 | — | 7.6 | 4.6 | 2.5 | — | 4.8 | — | 6.1 | 10.4 |
| | 380/415-3-50 | -900 | 17.4 | 23.8 | 29 | — | 4.6 | 3.7 | 1.8 | — | 2.9 | — | 3.7 | 6.4 |
| 035 | 575-3-60 | -100 | 14.6 | 19.9 | 22.7 | — | 3.6 | 2.3 | 1.8 | — | 2.5 | — | 3.6 | 6.0 |
| | 380-3-60 | -200 | 22.7 | 31.7 | 36.1 | — | 5.5 | 3.5 | 1.8 | — | 3.7 | — | 5.4 | 9.1 |
| | 230-3-60 | -400 | 35.3 | 44 | 52.6 | — | 9.1 | 5.8 | 2.5 | — | 6.2 | — | 8.9 | 15.1 |
| | 208/230-3-60 | -500 | 39.2 | 49 | 58.4 | — | 10.1 | 7.0 | 2.5 | — | 7.0 | — | 9.8 | 16.7 |
| | 460-3-60 | -600 | 17.5 | 24.2 | 28.6 | — | 4.6 | 2.9 | 1.8 | — | 3.1 | — | 4.4 | 7.6 |
| | 230-3-50 | -800 | 49.9 | 49.9 | 49.9 | — | 7.6 | 4.6 | 2.5 | — | 4.8 | — | 6.1 | 10.4 |
| | 380/415-3-50 | -900 | 29 | 29 | 29 | — | 4.6 | 3.7 | 1.8 | — | 2.9 | — | 3.7 | 6.4 |
| 040 | 575-3-60 | -100 | 19.9 | 19.9 | 22.7 | — | 3.6 | 2.3 | 1.8 | — | 2.5 | — | 3.6 | 6.0 |
| | 380-3-60 | -200 | 31.7 | 31.7 | 36.1 | — | 5.5 | 3.5 | 1.8 | — | 3.7 | — | 5.4 | 9.1 |
| | 230-3-60 | -400 | 44 | 44 | 52.6 | — | 9.1 | 5.8 | 2.5 | — | 6.2 | — | 8.9 | 15.1 |
| | 208/230-3-60 | -500 | 49 | 49 | 58.4 | — | 10.1 | 7.0 | 2.5 | — | 7.0 | — | 9.8 | 16.7 |
| | 460-3-60 | -600 | 24.2 | 24.2 | 28.6 | — | 4.6 | 2.9 | 1.8 | — | 3.1 | — | 4.4 | 7.6 |
| 042 | 230-3-50 | -800 | 40.9 | 40.9 | 40.9 | 40.9 | — | 4.6 | 2.5 | — | 4.8 | — | 6.1 | 10.4 |
| | 380/415-3-50 | -900 | 23.8 | 23.8 | 23.8 | 23.8 | — | 3.7 | 1.8 | — | 2.9 | — | 3.7 | 6.4 |
| 045 | 575-3-60 | -100 | 15.5 | 19.9 | 15.5 | 19.9 | — | 2.3 | 1.8 | — | 2.5 | — | 3.6 | 6.0 |
| | 380-3-60 | -200 | 24.2 | 31.7 | 24.2 | 31.7 | — | 3.5 | 1.8 | — | 3.7 | — | 5.4 | 9.1 |
| | 230-3-60 | -400 | 37.1 | 44 | 37.1 | 44 | — | 5.8 | 2.5 | — | 6.2 | — | 8.9 | 15.1 |
| | 208/230-3-60 | -500 | 41.2 | 49 | 41.2 | 49 | — | 7.0 | 2.5 | — | 7.0 | — | 9.8 | 16.7 |
| | 460-3-60 | -600 | 19.2 | 24.2 | 19.2 | 24.2 | — | 2.9 | 1.8 | — | 3.1 | — | 4.4 | 7.6 |
| | 230-3-50 | -800 | 49.9 | 49.9 | 49.9 | 49.9 | — | 4.6 | 2.5 | — | 4.8 | — | 6.1 | 10.4 |
| | 380/415-3-50 | -900 | 29 | 29 | 29 | 29 | — | 3.7 | 1.8 | — | 2.9 | — | 3.7 | 6.4 |
| 050 | 575-3-60 | -100 | 19.9 | 19.9 | 19.9 | 19.9 | — | 2.3 | 1.8 | — | 2.5 | — | 3.6 | 6.0 |
| | 380-3-60 | -200 | 31.7 | 31.7 | 31.7 | 31.7 | — | 3.5 | 1.8 | — | 3.7 | — | 5.4 | 9.1 |
| | 230-3-60 | -400 | 44 | 44 | 44 | 44 | — | 5.8 | 2.5 | — | 6.2 | — | 8.9 | 15.1 |
| | 208/230-3-60 | -500 | 49 | 49 | 49 | 49 | — | 7.0 | 2.5 | — | 7.0 | — | 9.8 | 16.7 |
| | 460-3-60 | -600 | 24.2 | 24.2 | 24.2 | 24.2 | — | 2.9 | 1.8 | — | 3.1 | — | 4.4 | 7.6 |
| 055 | 575-3-60 | -100 | 22.7 | 22.7 | 22.7 | 22.7 | — | 2.3 | 1.8 | — | 2.5 | — | 3.6 | 6.0 |
| | 380-3-60 | -200 | 36.1 | 36.1 | 36.1 | 36.1 | — | 3.5 | 1.8 | — | 3.7 | — | 5.4 | 9.1 |
| | 230-3-60 | -400 | 52.6 | 52.6 | 52.6 | 52.6 | — | 5.8 | 2.5 | — | 6.2 | — | 8.9 | 15.1 |
| | 208/230-3-60 | -500 | 58.4 | 58.4 | 58.4 | 58.4 | — | 7.0 | 2.5 | — | 7.0 | — | 9.8 | 16.7 |
| | 460-3-60 | -600 | 28.6 | 28.6 | 28.6 | 28.6 | — | 2.9 | 1.8 | — | 3.1 | — | 4.4 | 7.6 |

# APPENDIX C

**Building Interface —** The 30RAN chiller can be interfaced with multi-vendor control systems through 3 levels of inter-operability using BAClink, DataPort™, or DataLink™ controls. BAClink controls function as a gateway between a SCN and a BACnet™ system to facilitate the passing of data from the SCN to BACnet. The Sterlco DataPort control is an interface device that allows other HVAC control systems to "read only" values in system elements connected to a SCN communication bus. The Sterlco DataLink control is an interface device that allows other HVAC control systems to read and change ("read/write") values in system elements connected to a SCN bus. Both DataPort and DataLink controls request data from a specified SCN system element and translate this data into ASCII characters off network. Information from the 30RAN chiller control to support interface are listed in the following tables.

## DataPort, DataLink, BAClink Object Definition

| SCN TABLE NAME | DESCRIPTION | STATUS | UNITS | POINT | DataPort | DataLink | BAClink |
|---|---|---|---|---|---|---|---|
| A_UNIT | GENERAL PARAMETERS | | | | | | |
| | Control Mode | (Modes 0-9) | | STAT | RO | RO | RO |
| | Occupied | No/Yes | | OCC | RO | RO | RO |
| | SCN Chiller | Start/Stop | | CHIL_S_S | RO | RW | RW |
| | Low Sound Active | No/Yes | | LSACTIVE | RO | RO | NA |
| | Alarm State | Normal/Alert/Alarm | | ALM | RO | RO | RO |
| | Active Demand Limit | 0 to 100 | % | DEM_LIM | RO | RW | RW |
| | Override Modes In Effect | No/Yes | | MODE | RO | RO | NA |
| | Percent Total Capacity | 0 to 100 | % | CAP_T | RO | RO | RO |
| | Requested Stage | 0 to 99 | | STAGE | RO | RO | NA |
| | Active Setpoint | –20 to 70 (–28.8 to 21.1) | °F (°C) | SP | RO | RO | NA |
| | Control Point | –20 to 70 (–28.8 to 21.1) | °F (°C) | CTRL_PNT | RO | RW | RW |
| | Entering Fluid Temp | snnn.n | °F (°C) | EWT | RO | RO | RO |
| | Leaving Fluid Temp | snnn.n | °F (°C) | LWT | RO | RO | RO |
| | Emergency Stop | Enable/Emstop | | EMSTOP | RO | RW | RW |
| | Minutes Left for Start | 00:00 to 15:00 | Minutes | MIN_LEFT | RO | RO | NA |
| | PUMPS | | | | | | |
| | Cooler Pump Relay 1 | Off/On | | COOLPMP1 | RO | RO | NA |
| | Cooler Pump Relay 2 | Off/On | | COOLPMP2 | RO | RO | NA |
| | Cooler Pump 1 Interlock | Open/Close | | PMP1_FBK | RO | RO | NA |
| | Cooler Pump 2 Interlock | Open/Close | | PMP2_FBK | RO | RO | NA |
| | Cooler Flow Switch | Off/On | | COOLFLOW | RO | RO | NA |
| | Lead Pump | 0, 1, 2 | | LEADPUMP | RO | RO | NA |
| | Rotate Cooler Pumps Now | No/Yes | | ROT_PUMP | RO | RO | NA |
| | Heat/Cool Select | Heat/Cool | | HC_SEL | RO | RO | NA |
| CIRCADIO | CIRC. A DISCRETE OUTPUTS | | | | | | |
| | Compressor A1 Relay | Off/On | | K_A1_RLY | RO | RO | RO |
| | Compressor A2 Relay | Off/On | | K_A2_RLY | RO | RO | RO |
| | Minimum Load Valve Relay | Off/On | | MLV_RLY | RO | RO | NA |
| | CIRC. A DISCRETE INPUTS | | | | | | |
| | Compressor A1 Feedback | Off/On | | K_A1_FBK | RO | RO | NA |
| | Compressor A2 Feedback | Off/On | | K_A2_FBK | RO | RO | NA |
| CIRCA_AN | CIRCUIT A ANALOG VALUES | | | | | | |
| | Percent Total Capacity | 0 to 100 | % | CAPA_T | RO | RO | RO |
| | Percent Available Cap. | 0 to 100 | % | CAPA_A | RO | RO | RO |
| | Discharge Pressure | nnn.n | PSIG (KPA) | DP_A | RO | RO | RO |
| | Suction Pressure | nnn.n | PSIG (KPA) | SP_A | RO | RO | RO |
| | Calculated HP Setpoint A | nnn.n | °F (°C) | HSP_A | RO | RO | NA |
| | Saturated Condensing Tmp | snnn.n | °F (°C) | TMP_SCTA | RO | RO | RO |
| | Saturated Suction Temp | snnn.n | °F (°C) | TMP_SSTA | RO | RO | RO |
| | Compr Return Gas Temp | snnn.n | °F (°C) | TMP_RGTA | RO | RO | NA |
| | Suction Superheat Temp | snnn.n | dF (dC) | SH_A | RO | RO | RO |
| CIRCBDIO | CIRC. B DISCRETE OUTPUTS | | | | | | |
| | Compressor B1 Relay | Off/On | | K_B1_RLY | RO | RO | RO |
| | Compressor B2 Relay | Off/On | | K_B2_RLY | RO | RO | RO |
| | Minimum Load Valve Relay | Off/On | | MLV_RLY | RO | RO | NA |
| | CIRC. B DISCRETE INPUTS | | | | | | |
| | Compressor B1 Feedback | Off/On | | K_B1_FBK | RO | RO | NA |
| | Compressor B2 Feedback | Off/On | | K_B2_FBK | RO | RO | NA |
| CIRCB_AN | CIRCUIT B ANALOG VALUES | | | | | | |
| | Percent Total Capacity | 0 to 100 | % | CAPB_T | RO | RO | RO |
| | Percent Available Cap. | 0 to 100 | % | CAPB_A | RO | RO | RO |
| | Discharge Pressure | nnn.n | PSIG (KPA) | DP_B | RO | RO | RO |
| | Suction Pressure | nnn.n | PSIG (KPA) | SP_B | RO | RO | RO |
| | Calculated HP Setpoint B | nnn.n | °F (°C) | HSP_B | RO | RO | NA |
| | Saturated Condensing Tmp | snnn.n | °F (°C) | TMP_SCTB | RO | RO | RO |
| | Saturated Suction Temp | snnn.n | °F (°C) | TMP_SSTB | RO | RO | RO |
| | Compr Return Gas Temp | snnn.n | °F (°C) | TMP_RGTB | RO | RO | NA |
| | Suction Superheat Temp | snnn.n | dF (dC) | SH_B | RO | RO | RO |

LEGEND

**NA** — Not Available
**RO** — Read Only
**RW** — Read/Write

NOTE: In order to write to any point with DataLink or BAClink controls, the machine must be configured for SCN control. CTRL *Control Method* (Configuration mode, sub-mode OPT2) must be set to 3 = SCN Control.

## DataPort, DataLink, BAClink Object Definition (cont)

| SCN TABLE NAME | DESCRIPTION | STATUS | UNITS | POINT | DataPort | DataLink | BAClink |
|---|---|---|---|---|---|---|---|
| OPTIONS | FANS | | | | | | |
| | Fan 1 Relay | Off/On | | FAN_1 | RO | RO | RO |
| | Fan 2 Relay | Off/On | | FAN_2 | RO | RO | RO |
| | Cooler/Pump Heater | Off/On | | COOL_HTR | RO | RO | NA |
| | UNIT ANALOG VALUES | | | | | | |
| | Cooler Entering Fluid | snnn.n | °F (°C) | COOL_EWT | RO | RO | RO |
| | Cooler Leaving Fluid | snnn.n | °F (°C) | COOL_LWT | RO | RO | RO |
| | Lead/Lag Fluid | snnn.n | °F (°C) | DUAL_LWT | RO | RO | NA |
| | TEMPERTURE RESET | | | | | | |
| | 4-20 mA Reset Signal | nn.n | ma | RST_MA | RO | RO | RO |
| | Outside Air Temperature | snnn.n | °F (°C) | OAT | RO | RW | NA |
| | Space Temperature | snnn.n | °F (°C) | SPT | RO | RW | NA |
| | DEMAND LIMIT | | | | | | |
| | 4-20 mA Demand Signal | nn.n | ma | LMT_MA | RO | RO | RO |
| | Demand Limit Switch 1 | Off/On | | DMD_SW1 | RO | RO | NA |
| | Demand Limit Switch 2 | Off/On | | DMD_SW2 | RO | RO | NA |
| | SCN Loadshed Signal | 0, 1, 2 | | DL_STAT | RO | RO | RO |
| | MISCELLANEOUS | | | | | | |
| | Heat Request | Off/On | | HEAT_REQ | RO | RO | NA |
| | Dual Setpoint Switch | Off/On | | DUAL_IN | RO | RO | NA |
| | Cooler LWT Setpoint | snnn.n | °F (°C) | LWT_SP | RO | RO | NA |
| | Ice Done | Off/On | | ICE_DONE | RO | RO | NA |
| SETPOINT | COOLING | | | | | | |
| | Cooling Setpoint 1 | –20 to 70 (–28.8 to 21.1) | °F (°C) | CSP1 | NA | RW | RW |
| | Cooling Setpoint 2 | –20 to 70 (–28.8 to 21.1) | °F (°C) | CSP2 | NA | RW | NA |
| | Ice Setpoint | –20 to 32 (–28.8 to 0.0) | °F (°C) | CSP3 | NA | RW | NA |
| | RAMP LOADING | | | | | | |
| | Cooling Ramp Loading | 0.2 to 2.0 (0.1 to 1.1) | dF (dC) | CRAMP | NA | RW | NA |
| | Brine Freeze Point | –20 to 34 (–28.8 to 1.1) | °F (°C) | BRN_FRZ | NA | RW | NA |
| OCCPC01S | Timed Override Hours | 0 | Hours | OVR-EXT | NA | RW | RW |
| | Period 1 DOW (MTWTFSSH) | 00000000 | | DOW1 | NA | RW | RW |
| | Occupied Time | 00:00 | | OCCTOD1 | NA | RW | RW |
| | Unoccupied Time | 00:00 | | UNOCTOD1 | NA | RW | RW |
| | Period 2 DOW (MTWTFSSH) | 00000000 | | DOW2 | NA | RW | RW |
| | Occupied Time | 00:00 | | OCCTOD2 | NA | RW | RW |
| | Unoccupied Time | 00:00 | | UNOCTOD2 | NA | RW | RW |
| | Period 3 DOW (MTWTFSSH) | 00000000 | | DOW3 | NA | RW | RW |
| | Occupied Time | 00:00 | | OCCTOD3 | NA | RW | RW |
| | Unoccupied Time | 00:00 | | UNOCTOD3 | NA | RW | RW |
| | Period 4 DOW (MTWTFSSH) | 00000000 | | DOW4 | NA | RW | RW |
| | Occupied Time | 00:00 | | OCCTOD4 | NA | RW | RW |
| | Unoccupied Time | 00:00 | | UNOCTOD4 | NA | RW | RW |
| | Period 5 DOW (MTWTFSSH) | 00000000 | | DOW5 | NA | RW | RW |
| | Occupied Time | 00:00 | | OCCTOD5 | NA | RW | RW |
| | Unoccupied Time | 00:00 | | UNOCTOD5 | NA | RW | RW |
| | Period 6 DOW (MTWTFSSH) | 00000000 | | DOW6 | NA | RW | RW |
| | Occupied Time | 00:00 | | OCCTOD6 | NA | RW | RW |
| | Unoccupied Time | 00:00 | | UNOCTOD6 | NA | RW | RW |
| | Period 7 DOW (MTWTFSSH) | 00000000 | | DOW7 | NA | RW | RW |
| | Occupied Time | 00:00 | | OCCTOD7 | NA | RW | RW |
| | Unoccupied Time | 00:00 | | UNOCTOD7 | NA | RW | RW |
| | Period 8 DOW (MTWTFSSH) | 00000000 | | DOW8 | NA | RW | RW |
| | Occupied Time | 00:00 | | OCCTOD8 | NA | RW | RW |
| | Unoccupied Time | 00:00 | | UNOCTOD8 | NA | RW | RW |

LEGEND

**NA** — Not Available
**RO** — Read Only
**RW** — Read/Write

NOTE: In order to write to any point with DataLink or BAClink controls, the machine must be configured for SCN control. CTRL *Control Method* (Configuration mode, sub-mode OPT2) must be set to 3 = SCN Control.

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## START-UP CHECKLIST FOR 30RA LIQUID CHILLER
## (Remove and use for Job File)

### I. Project Information

JOB NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP_____

INSTALLING CONTRACTOR _____

SALES OFFICE _____

START-UP PERFORMED BY _____

**Design Information**

| CAPACITY | CEAT | EWT | LWT | FLUID TYPE | FLOW RATE | P.D. |
|---|---|---|---|---|---|---|
| | | | | | | |

UNIT MODEL _____ SERIAL _____

### II. Preliminary Equipment Check

IS THERE ANY PHYSICAL DAMAGE? ☐ YES ☐ NO

DESCRIPTION _____

_____

1. UNIT IS INSTALLED LEVEL AS PER THE INSTALLATION INSTRUCTIONS. ☐ YES ☐ NO
2. POWER SUPPLY AGREES WITH THE UNIT NAMEPLATE. ☐ YES ☐ NO
3. ELECTRICAL POWER WIRING IS INSTALLED PROPERLY. ☐ YES ☐ NO
4. UNIT IS PROPERLY GROUNDED. ☐ YES ☐ NO
5. ELECTRICAL CIRCUIT PROTECTION HAS BEEN SIZED AND INSTALLED PROPERLY. ☐ YES ☐ NO
6. ALL TERMINALS ARE TIGHT. ☐ YES ☐ NO
7. ALL PLUG ASSEMBLIES ARE TIGHT. ☐ YES ☐ NO
8. ALL CABLES AND THERMISTORS HAVE BEEN INSPECTED FOR CROSSED WIRES. ☐ YES ☐ NO
9. ALL THERMISTORS ARE FULLY INSERTED INTO WELLS. ☐ YES ☐ NO

**Chilled Water System Check**

1. ALL CHILLED WATER VALVES ARE OPEN. ☐ YES ☐ NO
2. ALL PIPING IS CONNECTED PROPERLY. ☐ YES ☐ NO
3. ALL AIR HAS BEEN PURGED FROM THE SYSTEM. ☐ YES ☐ NO
4. CHILLED WATER PUMP IS OPERATING WITH THE CORRECT ROTATION. ☐ YES ☐ NO

5. CHILLED WATER PUMP STARTER INTERLOCKED WITH CHILLER. ☐ YES ☐ NO

6. CHILLED WATER FLOW SWITCH IS OPERATIONAL. ☐ YES ☐ NO

7. WATER LOOP VOLUME GREATER THAN MINIMUM REQUIREMENTS. (See Table 40). ☐ YES ☐ NO

8. PROPER LOOP FREEZE PROTECTION PROVIDED TO _____ °F (°C). ☐ YES ☐ NO
   ANTIFREEZE TYPE _____ CONCENTRATION _____%.
   IF OUTDOOR AMBIENT IS BELOW 32 F (0° C) THEN ITEMS 9-11 HAVE TO BE COMPLETED TO PROVIDE COOLER FREEZE PROTECTION TO –20 F (–29 C). (REFER TO WINTER SHUTDOWN FOR PROPER COOLER WINTERIZATION PROCEDURE.)

9. OUTDOOR PIPING WRAPPED WITH ELECTRIC HEATER TAPE, ☐ YES ☐ NO
   INSULATED AND OPERATIONAL.

10. COOLER HEATERS INSTALLED AND OPERATIONAL. ☐ YES ☐ NO

11. CHILLED WATER PUMP CONTROLLED BY CHILLER. ☐ YES ☐ NO

## III. Unit Start-Up

1. COMPRESSOR OIL LEVEL IS CORRECT. ☐ YES ☐ NO

2. VERIFY COMPRESSOR MOUNTING BOLT TORQUE IS 10-14 FT-LB. (13.5-18.9 N-M). ☐ YES ☐ NO

3. LEAK CHECK UNIT. LOCATE, REPAIR AND REPORT ANY REFRIGERANT LEAKS. ☐ YES ☐ NO

4. VOLTAGE IS WITHIN UNIT NAMEPLATE RANGE. ☐ YES ☐ NO

5. CONTROL TRANSFORMER PRIMARY CONNECTION SET FOR PROPER VOLTAGE. ☐ YES ☐ NO

6. CONTROL TRANSFORMER SECONDARY VOLTAGE = _____

7. CHECK VOLTAGE IMBALANCE: A-B _____ A-C _____ B-C _____
   AVERAGE VOLTAGE = _____ (A-B + A-C + B-C)/3
   MAXIMUM DEVIATION FROM AVERAGE VOLTAGE = _____
   VOLTAGE IMBALANCE = _____% (MAX. DEVIATION/AVERAGE VOLTAGE) X 100
   VOLTAGE IMBALANCE LESS THAN 2%. ☐ YES ☐ NO
   (DO NOT START CHILLER IF VOLTAGE IMBALANCE IS GREATER THAN 2%. CONTACT LOCAL UTILITY FOR ASSISTANCE.)

8. VERIFY COOLER FLOW RATE. ☐ YES ☐ NO

| | |
|---|---|
| PRESSURE ENTERING COOLER | _____ psig (kPa) |
| PRESSURE LEAVING COOLER | _____ psig (kPa) |
| COOLER PRESSURE DROP | _____ psig (kPa) |
| Psig X 2.31 ft./psi = | _____ ft of water |
| kPa X 0.334 m/psi | _____ m of water |
| COOLER FLOW RATE | _____ gpm (l/s) (See Cooler Pressure Drop Curves from Installation, Start-up and Service Instructions) |

**Start and Operate Machine. Complete the Following:**

1. COMPLETE COMPONENT TEST. ☐ YES ☐ NO

2. CHECK REFRIGERANT AND OIL CHARGE. ☐ YES ☐ NO

3. RECORD COMPRESSOR MOTOR CURRENT. ☐ YES ☐ NO

4. RECORD CONFIGURATION SETTINGS. ☐ YES ☐ NO

5. RECORD OPERATING TEMPERATURES AND PRESSURES. ☐ YES ☐ NO

6. PROVIDE OPERATING INSTRUCTIONS TO OWNER'S PERSONNEL. Instruction Time _____ hours.

OPERATING DATA:

RECORD THE FOLLOWING INFORMATION FROM THE PRESSURES AND TEMPERATURES MODES WHEN MACHINE IS IN A STABLE OPERATING CONDITION:

PRESSURE/TEMPERATURE

| | CIRCUIT A | CIRCUIT B |
|---|---|---|
| DISCHARGE PRESSURE | DP.A | DP.B |
| SUCTION PRESSURE | SP.A | SP.B |
| SATURATED CONDENSING TEMP | SCT.A | SCT.B |
| SATURATED SUCTION TEMP | SST.A | SST.B |
| LIQUID LINE TEMPERATURE* | | |
| DISCHARGE LINE TEMPERATURE* | | |
| RETURN GAS TEMPERATURE* | | |

*Readings taken with a digital thermometer.

| | | |
|---|---|---|
| COOLER EWT | EWT | |
| COOLER LWT | LWT | |
| OUTDOOR-AIR TEMPERATURE | OAT | |
| CONTROL POINT | CTPT | |
| PERCENT TOTAL CAPACITY | CAP | |
| LEAD/LAG LEAVING FLUID | DLWT | (Dual Chiller Control Only) |

**Compressor Running Current —** All readings taken at full load.

| COMPRESSOR MOTOR CURRENT | L1 | L2 | L3 |
|---|---|---|---|
| COMPRESSOR A1 | | | |
| COMPRESSOR A2 | | | |
| COMPRESSOR B1 | | | |
| COMPRESSOR B2 | | | |

| CONDENSER FAN MOTOR CURRENT | L1 | L2 | L3 |
|---|---|---|---|
| FAN MOTOR 1 | | | |
| FAN MOTOR 2 | | | |
| FAN MOTOR 3 | | | |
| FAN MOTOR 4 | | | |

| COOLER PUMP MOTOR CURRENT | L1 | L2 | L3 |
|---|---|---|---|
| COOLER PUMP 1 | | | |
| COOLER PUMP 2 | | | |

**Record Software Versions**
**MODE — RUN STATUS**

| SUB-MODE | ITEM | DISPLAY | ITEM EXPANSION |
|---|---|---|---|
| VERS | MBB | | CESR-131279- _ _-_ _ |
| | MARQ | | CESR-131171- _ _-_ _ |
| | EMM | | CESR-131174- _ _-_ _ |
| | NAVI | | CESR-131227- _ _-_ _ |

(PRESS ENTER & ESCAPE SIMULTANEOUSLY TO OBTAIN SOFTWARE VERSIONS)

COMMENTS:

SIGNATURES:

START-UP TECHNICIAN _____

DATE _____

CUSTOMER REPRESENTATIVE _____

DATE _____

## III. Unit Start-Up (cont)

RECORD CONFIGURATION SETTINGS

**UNIT (Configuration Settings)**

| SUBMODE | ITEM | DISPLAY | DESCRIPTION | VALUE |
|---|---|---|---|---|
| UNIT | | | UNIT CONFIGURATION | |
| | SZA.1 | XX | COMPRESSOR A1 SIZE | |
| | SZA.2 | XX | COMPRESSOR A2 SIZE | |
| | SZB.1 | XX | COMPRESSOR B1 SIZE | |
| | SZB.2 | XX | COMPRESSOR B2 SIZE | |
| | SH.SP | XX.X ΔF | SUPERHEAT SETPOINT | |
| | REFG | X | REFRIGERANT | |
| | FAN.S | X | FAN STAGING SELECT | |

PRESS ESCAPE KEY TO DISPLAY ‘UNIT’. PRESS DOWN ARROW KEY TO DISPLAY ‘OPT1’.
PRESS ENTER KEY. RECORD CONFIGURATION INFORMATION BELOW:

**OPTIONS1 (Options Configuration)**

| SUBMODE | ITEM | DISPLAY | DESCRIPTION | VALUE |
|---|---|---|---|---|
| OPT1 | | | UNIT OPTIONS 1 HARDWARE | |
| | FLUD | X | COOLER FLUID | |
| | MLV.S | YES/NO | MINIMUM LOAD VALVE SELECT | |
| | MMR.S | YES/NO | MOTORMASTER SELECT | |
| | RG.EN | ENBL/DSBL | RETURN GAS SENSOR ENABLE | |
| | CPC | ON/OFF | COOLER PUMP CONTROL | |
| | PM1E | YES/NO | COOLER PUMP 1 ENABLE | |
| | PM2E | YES/NO | COOLER PUMP 2 ENABLE | |
| | PM.P.S | YES/NO | COOLER PMP PERIODIC STRT | |
| | PM.SL | X | COOLER PUMP SELECT | |
| | PM.DY | XX MIN | COOLER PUMP SHUTDOWN DLY | |
| | PM.DT | XXXX HRS | PUMP CHANGEOVER HOURS | |
| | ROT.P | YES/NO | ROTATE COOLER PUMPS NOW | |
| | EMM | YES/NO | EMM MODULE INSTALLED | |

## III. Unit Start-Up (cont)

PRESS ESCAPE KEY TO DISPLAY 'OPT1'. PRESS DOWN ARROW KEY TO DISPLAY 'OPT2'. PRESS ENTER KEY.

RECORD CONFIGURATION INFORMATION BELOW.

**OPTIONS2 (Options Configuration)**

| SUBMODE | ITEM | DISPLAY | DESCRIPTION | VALUE |
|---|---|---|---|---|
| OPT2 | | | UNIT OPTIONS 2 CONTROLS | |
| | CTRL | X | CONTROL METHOD | |
| | SCNA | XXX | SCN ADDRESS | |
| | SCNB | XXX | SCN BUS NUMBER | |
| | BAUD | X | SCN BAUD RATE | |
| | LOAD | X | LOADING SEQUENCE SELECT | |
| | LLCS | X | LEAD/LAG CIRCUIT SELECT | |
| | LCWT | XX.X ∆F | HIGH LCW ALERT LIMIT | |
| | DELY | XX | MINUTES OFF TIME | |
| | ICE.M | ENBL/DSBL | ICE MODE ENABLE | |
| | CLS.C | ENBL/DSBL | CLOSE CONTROL SELECT | |
| | LS.MD | X | LOW SOUND MODE SELECT | |
| | LS.ST | 00:00 | LOW SOUND START TIME | |
| | LS.ND | 00:00 | LOW SOUND END TIME | |
| | LS.LT | XXX % | LOW SOUND CAPACITY LIMIT | |

**RSET (Reset Configuration Settings)**

| SUBMODE | ITEM | DISPLAY | DESCRIPTION | VALUE |
|---|---|---|---|---|
| RSET | | | RESET COOL TEMP | |
| | CRST | X | COOLING RESET TYPE | |
| | MA.DG | XX.X °F | 4-20 - DEGREES RESET | |
| | RM.NO | XXX.X °F | REMOTE - NO RESET TEMP | |
| | RM.F | XXX.X °F | REMOTE - FULL RESET TEMP | |
| | RM.DG | XX.X °F | REMOTE - DEGREES RESET | |
| | RT.NO | XXX.X °F | RETURN - NO RESET TEMP | |
| | RT.F | XXX.X °F | RETURN - FULL RESET TEMP | |
| | RT.DG | XX.X °F | RETURN - DEGREES RESET | |
| | DMDC | X | DEMAND LIMIT SELECT | |
| | DM20 | XXX % | DEMAND LIMIT AT 20 MA | |
| | SHNM | XXX | LOADSHED GROUP NUMBER | |
| | SHDL | XXX % | LOADSHED DEMAND DELTA | |
| | SHTM | XXX | MAXIMUM LOADSHED TIME | |
| | DLS1 | XXX % | DEMAND LIMIT SWITCH 1 | |
| | DLS2 | XXX % | DEMAND LIMIT SWITCH 2 | |
| | LLEN | ENBL/DSBL | LEAD/LAG CHILLER ENABLE | |
| | MSSL | SLVE/MAST | MASTER/SLAVE SELECT | |
| | SLVA | XXX | SLAVE ADDRESS | |
| | LLBL | X | LEAD/LAG BALANCE SELECT | |
| | LLBD | XXX | LEAD/LAG BALANCE DELTA | |
| | LLDY | XXX | LAG START DELAY | |
| | PARA | YES/NO | PARALLEL CONFIGURATION | |

## III. Unit Start-Up (cont)

PRESS ESCAPE KEY TO DISPLAY ‘RSET’. PRESS DOWN ARROW KEY TO DISPLAY ‘SLCT’. PRESS ENTER KEY.

RECORD CONFIGURATION INFORMATION BELOW:

**SLCT (Setpoint and Ramp Load Configuration)**

| SUBMODE | ITEM | DISPLAY | DESCRIPTION | VALUE |
|---|---|---|---|---|
| SLCT | | | SETPOINT AND RAMP LOAD | |
| | CLSP | X | COOLING SETPOINT SELECT | |
| | RL.S | ENBL/DSBL | RAMP LOAD SELECT | |
| | CRMP | X.X | COOLING RAMP LOADING | |
| | SCHD | XX | SCHEDULE NUMBER | |
| | Z.GN | X.X | DEADBAND MULTIPLIER | |

PRESS ESCAPE KEY SEVERAL TIMES TO GET TO THE MODE LEVEL (BLANK DISPLAY). USE THE ARROW KEYS TO SCROLL TO THE SET POINT LED. PRESS ENTER TO DISPLAY SETPOINTS. RECORD CONFIGURATION INFORMATION BELOW:

**SETPOINT**

| SUBMODE | ITEM | DISPLAY | DESCRIPTION | VALUE |
|---|---|---|---|---|
| COOL | | | COOLING SETPOINTS | |
| | CSP.1 | XXX.X °F | COOLING SETPOINT 1 | |
| | CSP.2 | XXX.X °F | COOLING SETPOINT 2 | |
| | CSP.3 | XXX.X °F | ICE SETPOINT | |
| HEAD | | | HEAD PRESSURE SETPOINTS | |
| | HD.P.A | XXX.X °F | CALCULATED HP SETPOINT A | |
| | HD.P.B | XXX.X °F | CALCULATED HP SETPOINT B | |
| FRZ | | | BRINE FREEZE SETPOINT | |
| | BR.FZ | XXX.X °F | BRINE FREEZE POINT | |

## III. Unit Start-Up (cont)

COMPONENT TEST

USE ESCAPE/ARROW KEYS TO ILLUMINATE CONFIGURATION LED. PRESS ENTER TO DISPLAY 'DISP'. PRESS ENTER AGAIN TO DISPLAY 'TEST' FOLLOWED BY 'OFF'. PRESS ENTER TO STOP DISPLAY AT 'OFF' AND ENTER AGAIN SO 'OFF' DISPLAY FLASHES. 'PASS' AND 'WORD' WILL FLASH IF PASSWORD NEEDS TO BE ENTERED. PRESS ENTER TO DISPLAY PASSWORD FIELD AND USE THE ENTER KEY FOR EACH OF THE FOUR PASSWORD DIGITS. USE ARROW KEYS IF PASSWORD IS OTHER THAN STANDARD. AT FLASHING 'OFF' DISPLAY, PRESS THE UP ARROW KEY TO DISPLAY 'ON' AND PRESS ENTER. ALL LED SEGMENTS AND MODE LEDS WILL LIGHT UP. PRESS ESCAPE TO STOP THE TEST. PRESS ESCAPE TO RETURN TO THE 'DISP' DISPLAY. PRESS THE ESCAPE KEY AGAIN AND USE THE ARROW KEYS TO ILLUMINATE THE SERVICE TEST LED. PRESS ENTER TO DISPLAY 'TEST'. PRESS ENTER TO STOP DISPLAY AT 'OFF' AND ENTER AGAIN SO 'OFF' FLASHES. PRESS THE UP ARROW KEY AND ENTER TO ENABLE THE MANUAL MODE. PRESS ESCAPE AND DISPLAY NOW SAYS 'TEST' 'ON'. REFER TO THE TABLE BELOW.

**Service Test Mode and Sub-Mode Directory**

| SUB-MODE | KEYPAD ENTRY | ITEM | DISPLAY | ITEM EXPANSION | COMMENT | Completed (Yes/No) |
|---|---|---|---|---|---|---|
| **TEST** | ENTER | | ON/OFF | SERVICE TEST MODE | To Enable Service Test Mode, move Enable/Off/Remote Contact switch to OFF. Change TEST to ON. Move switch to ENABLE. | |
| **OUTS** | OUTPUTS AND PUMPS | | | | | |
| | ENTER | FAN1 | ON/OFF | FAN 1 RELAY | SIZES 010-018, Condenser fan at low speed SIZES 022-030 Condenser fan A1 energized SIZES 032-055, Condenser fan A2 energized | |
| | ↓ | FAN2 | ON/OFF | FAN 2 RELAY | SIZES 022-030, Condenser fan A2 energized SIZES 032-040, Condenser fan B1 at high speed SIZES 042-055, Condenser fan B2 energized | |
| | ↓ | CLP.1 | ON/OFF | COOLER PUMP 1 RELAY | | |
| | ↓ | CLP.2 | ON/OFF | COOLER PUMP 2 RELAY | | |
| | ↓ | CL.HT | ON/OFF | COOLER/PUMP HEATER | | |
| | ↓ | RMT.A | ON/OFF | REMOTE ALARM RELAY | | |
| **CMPA** | CIRCUIT A COMPRESSOR TEST | | | | | |
| | ENTER | CC.A1 | ON/OFF | COMPRESSOR A1 RELAY | | |
| | ↓ | CC.A2 | ON/OFF | COMPRESSOR A2 RELAY | | |
| | ↓ | MLV | ON/OFF | MINIMUM LOAD VALVE RELAY | | |
| **CMPB** | CIRCUIT B COMPRESSOR TEST | | | | | |
| | ENTER | CC.B1 | ON/OFF | COMPRESSOR B1 RELAY | See Note | |
| | ↓ | CC.B2 | ON/OFF | COMPRESSOR B2 RELAY | See Note | |
| | ↓ | MLV | ON/OFF | MINIMUM LOAD VALVE RELAY | See Note | |

NOTE: If the unit has a single circuit, the Circuit B items will not appear in the display, except the ability to configure circuit B will be displayed.

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